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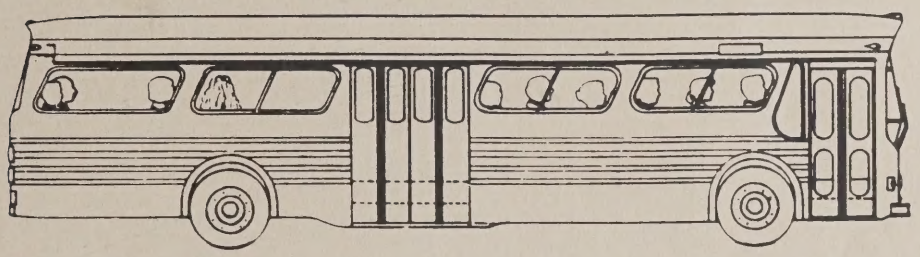

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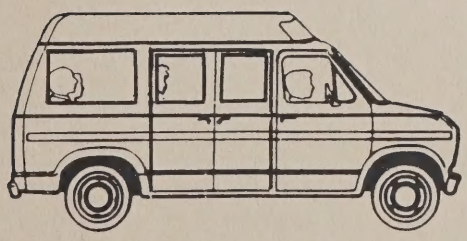

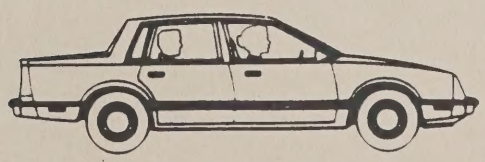

Ontario Ministry of Transportation
Transportation Technology and Energy Branch

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MEP-93-01

High Occupancy Vehicle Opportunities, Incentives and Examples

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Municipal Transportation Energy and Efficiency Advisory Committee
Transportation Energy and Productivity Office
Transportation Technology and Energy Branch

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Published by:
Transportation Technology and Energy Branch
Ministry of Transportation of Ontario

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Technical Publications (TT&E Branch)
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July 1993

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EXECUTIVE SUMMARY

The transportation system of every Ontario municipality is a critical component of the economic and social well-being of that community. However, with increased demands on usage, coupled with constraints on funding and increased environmental concerns, these transportation systems must change. They must place new emphases on management of travel demand, more efficient use of existing and new infrastructures, and a more environmentally sustainable transportation strategy.

In this context, high-occupancy vehicle (HOV) strategies are well suited to provide efficient, safe, convenient and low-cost alternatives to single occupancy automobile travel. If problems such as congestion, energy waste, air pollution, environmental impacts, cost of new infrastructures, and inconvenience in our transportation system are to be effectively addressed, HOV programs are sure to play a significant part.

What is a high-occupancy vehicle?

Simply put, HOVs are motor vehicles carrying more than a specified minimum number of people. An HOV can be a carpool, vanpool or a bus. The specific definition can vary – "2 or more," "3 or more," or "buses only" – depending on the requirements of the HOV program. An HOV lane is a lane on a road dedicated to HOV use for at least part of the day.

The goal of an HOV program is to induce a shift toward transit and multiple-occupancy automobile use by giving such vehicles priority treatment over single occupancy cars. The reasons for inducing such a shift may vary from municipality to municipality, reflecting local needs and conditions.

HOV programs are but one aspect of Transportation Demand Management (TDM) approaches to optimize the utilization and effectiveness of urban transportation systems.

In a free market for urban transportation such as exists in Ontario, opportunities to directly manage or control demand are relatively few. Instead of punitive restrictions, encouragement must be used. This means that in order for HOV programs to succeed, HOV use must be positioned in the transportation marketplace as the "mode of choice" – the mode that is fastest, most convenient, least costly, least environmentally degrading, and least wasteful of energy. In some urban areas where conditions are right (downtown Toronto and Ottawa, for example) HOVs have been selected by the public for at least the first three reasons.

There are, however, opportunities available in every community in Ontario to significantly enhance the speed, convenience, flexibility, cost and attractiveness of the HOV mode. In doing so, major strides toward a comprehensive and effective TDM strategy will have been made.

PART I

INTRODUCTION AND BACKGROUND INFORMATION

1/ Introduction

The transportation system of each Ontario municipality is a critical component of the economic and social well-being of those who live and work in the province's urbanized areas. Transportation systems face increasing demands and constraints in terms of usage, operation, safety, funding, and environmental impact. As an era of change sweeps through the world, transportation systems must change as well. Key aspects of that change are new emphasis on management of travel demand, more efficient use of existing and new infrastructures, and a shift toward a more environmentally sustainable transportation strategy.

In this context, high occupancy vehicle (HOV) programs have great potential to contribute to more efficient and effective transportation systems. In providing incentives and priority measures to encourage the use of transit, carpools, and vanpools rather than the single-occupant car, HOV programs can play a key role in changing our roads from congested conduits for vehicles to efficient systems for moving people and goods. Efficient, safe, convenient, and low-cost ways of moving people other than the single-occupant car exist. If problems such as congestion, air pollution, environmental impact, and cost of new infrastructure in our transportation system are to be effectively addressed, HOV programs are sure to play a significant part.

2/ Purpose of this Handbook

It is the purpose of this document to provide transportation planners, engineers, elected officials, and other interested parties in Ontario municipalities with an outline of the types of HOV initiatives available, and of the situations in which HOV measures are likely to be most effective. The handbook is especially for smaller and medium-sized cities and regions in Ontario; formal HOV-related planning and operational initiatives have made relatively few inroads there to date. There are, however, strategies in this report that could be used to significant benefit by communities of all sizes in the province. Freeway HOV applications are not dealt with in great detail in this document, as they are the subject of more detailed and separate ongoing studies and development, and are rarely under municipal jurisdiction.

The handbook is the product of the lessons learned in over two decades of HOV applications throughout North America, combined with the concerns and interests expressed by key professionals involved in providing municipal transportation services and facilities in Ontario. It is intended to function as a supplement and update to previous work in the field (such as the 1982 "Guidelines for Preferential Treatment of High Occupancy Vehicles" by the Ministries of Transportation and Energy), and to provide some locally relevant material to augment the various HOV guidelines recently

produced in the U.S. It is also intended to fill a gap that currently exists in the literature with respect to HOV treatments suited to smaller and medium-sized municipalities.

This handbook is not intended to be a design manual for HOV incentives. More detailed material is available elsewhere in all areas of HOV practice and local programs need to be developed individually to reflect community needs and circumstances.

3/ HOV Definition

What is a high-occupancy vehicle?

HOVs are vehicles carrying more than a specified minimum number of people. The minimum may vary according to the situation, and in some cases include only buses and in others include all forms of shared ride such as carpools, vanpools, and taxis. The purpose is to encourage the use of more efficient forms of transportation than the single-occupant car, and while in some cases that is best achieved by bus-oriented services and facilities, in others all vehicles carrying two or more persons would be the most appropriate definition. An HOV lane is any lane on a road dedicated to HOV use for at least part of the day: a reserved bus lane, or RBL, is an HOV lane restricted to use by buses only.

The effect of various HOV definitions will be discussed throughout the handbook, but if not otherwise specified, any reference to HOV in subsequent chapters should be taken as referring to a "2+" or "3+" vehicle.

4/ HOVs and the Transportation Demand Management Approach

Encouragement of high-occupancy vehicles use is only one aspect of the broad Transportation Demand Management (TDM) approach to optimizing the utilization and enhancing the effectiveness of urban transportation systems. If the provision of transportation service is viewed as an attempt to reach a supply/demand balance, TDM measures could be considered to focus on affecting the "demand" side of the equation, rather than the more traditional "supply" of transportation infrastructure.

In a free market for urban transportation, such as exists in Ontario, opportunities to directly manage or control demand are relatively few – for example, rather than banning single-occupant car use outright, measures and facilities that encourage the use of desirable alternatives must be used. This implies that, if the goals of any TDM or HOV program are to be met, HOV use must be positioned in the transportation marketplace as the "mode of choice" – as the mode that is fastest, most convenient, most flexible, least costly, least environmentally degrading, and least wasteful of energy. The latter three items are staples of the typical transit authority advertising campaign, and they are indeed true. In some areas where conditions are right

(downtown Toronto and Ottawa, for example), HOVs have also been selected by the public for the first three reasons.

There are, however, opportunities available in every community in Ontario to significantly enhance the speed, convenience, flexibility, cost, and attractiveness of the HOV mode. In doing so, major strides toward a comprehensive and effective Transportation Demand Management strategy that involves the support of the entire community will have been made.

It is also important to consider that a large portion of society is excluded from single-occupant auto use by reason of age, youth, infirmity, economic situation, or choice; if these Ontarians are "transit captive" as a result, it is imperative that a convenient, economical, effective transit service is available. The expansion of that service to include all forms of HOV could go a long way to ensuring life-long mobility for many thousands of people, including those who are "auto captive" due to lack of alternative arrangements and services.

5/ Ministry of Transportation HOV Position

The Ministry of Transportation of Ontario (MTO), as the main provincial agency responsible for intercity transportation and, increasingly, interregional and (through its municipal road and transit subsidy programs) local transportation, plays a key role in the development and application of transportation systems and strategies throughout the province. The ministry has long been active in supporting all aspects of HOV use, but only in recent years has the direction and intent of the province in the HOV field been defined.

MTO's current HOV position may be summarized as follows:

The province supports the creation of HOV lanes on provincial highways and municipal roads. A careful examination of the need and feasibility of such lanes would be needed prior to their introduction in any corridor.

It is recognized that there is a need to coordinate, plan, and develop the HOV lanes in cooperation with appropriate municipalities to ensure proper integration with the current and future transportation system. It is also recognized that support facilities, programs, and incentives are essential for the success of HOV lanes.

The provincial HOV policy has the following objectives:

- Maximize the use of existing roads and highways in the face of growing transportation demand.

- Reduce negative environmental effects of automobile commuting.

- Defer the costs for additional roads, highways, and transit lines.

- Complement existing and future transit services, e.g., feed existing transit terminals (enhance ridership).

In addition to the Ministry of Transportation, the Ministry of Energy has actively supported several HOV initiatives designed to reduce energy consumption in the transportation sector.

PART II

MUNICIPAL HOV STRATEGIES

6/ Goals and Objectives for Municipal HOV Programs

The goals of each municipal HOV program should be developed locally, and reflect Official Plan policies, transportation/land use conditions, and implementation strategies.

Broadly speaking, HOV programs typically are intended to induce a shift toward greater use of transit and multiple-occupant vehicles, to contribute to a reduction in the negative impact on air quality and energy use by the transportation sector, to improve personal mobility, and to contribute to an improved quality of life in both economic and social spheres.

Objectives associated with each particular HOV incentive may vary considerably; those of an arterial HOV lane will differ from those of a vanpool program. It is best to refer to the examples in this handbook, to additional documentation, and to the local situation in order to develop those specific objectives.

7/ HOV Incentive Strategies for Ontario Municipalities

7.1/ Municipality Groups

There are several dozen urban centres in Ontario, each with its own needs and aspirations. There is no single "HOV strategy" which can be applied; every program will evolve from the local level, and in particular from the leadership shown by the municipal government. Related private-sector actions and active provincial support will be major factors, but without municipal involvement little potential exists for an effective program.

This document is intended for municipal use, as a "primer" on HOV-related possibilities for Ontario centres. Recognizing the uniqueness of each municipality, a variety of HOV measures is presented in "menu" format in Part III. Each municipality may approach the menu in a different way, and the following text is intended to provide some guidance regarding appropriate strategies for various community types.

In Table 1, the province's 45 major municipal transit operators are listed, ranked by municipal population. Some notable transit use statistics are included, for interest only. It should be noted that not all municipalities are listed (e.g., Scarborough, York Region, etc.); however, this list was selected because it accurately reflects those municipal governments which are likely to be directly responsible for implementing transit (and by extension, HOV) measures. Any regional or local municipalities not listed can obviously consider HOV initiatives as well.

TABLE 1 / COMPARATIVE MUNICIPAL TRANSIT OPERATIONS MEASURES IN ONTARIO

MUNICIPALITY	POPULATION (1990)		TRANSIT RIDERSHIP (1990)			TRANSIT RIDERSHIP/ CAPITA / YEAR	
	TOTAL	RANK	ADULTS	TOTAL	RANK	TOTAL	RANK
METRO TORONTO	2,133,400	1	366,900,000	459,200,000	1	215.2	1
OTTAWA	605,766	2	N/A	80,654,000	2	133.1	2
MISSISSAUGA	465,400	3	17,255,822	21,025,598	4	45.2	8
HAMILTON	423,400	4	15,102,379	26,385,614	3	62.3	4
LONDON	296,000	5	15,055,000	17,799,000	5	60.1	5
KITCHENER	235,800	6	5,028,307	9,286,981	7	39.4	15
BRAMPTON	223,000	7	3,166,083	4,870,898	8	21.8	27
WINDSOR	193,000	8	7,719,927	12,582,568	6	65.2	3
MARKHAM	145,819	9	1,621,606	2,895,725	16	19.9	28
ST. CATHARINES	140,000	10	2,566,122	4,176,179	11	29.8	17
OSHAWA	128,000	11	1,263,186	3,699,065	12	28.9	18
BURLINGTON	124,270	12	685,218 *	2,019,394	21	16.3	33
THUNDER BAY	113,000	13	2,667,083	4,415,700	10	39.1	16
OAKVILLE	106,000	14	N/A	2,646,232	18	25.0	22
SUDBURY	98,869	15	N/A	4,686,281	9	47.4	9
VAUGHAN	93,479	16	2,128,083	2,599,344	20	27.8	19
CAMBRIDGE	88,660	17	790,926	1,481,513	25	16.7	32
GUELPH	85,000	18	3,037,378	3,609,058	13	42.5	11
BRANTFORD	83,399	19	712,866	1,827,009	24	21.9	26
SAULT STE. MARIE	80,000	20	1,992,187	3,162,201	15	39.5	14
RICHMOND HILL	78,439	21	240,359	511,403	36	6.5	42
SARNIA	73,798	22	942,587	1,327,561	28	18.0	31
NIAGARA FALLS	71,200	23	N/A	1,394,756	27	19.6	30
PICKERING	65,000	24	756,692 *	809,056	32	12.4	36
PETERBOROUGH	65,000	25	N/A	2,614,259	19	40.2	13
KINGSTON	60,912	26	2,234,348	3,223,998	14	52.9	7
WHITBY	55,000	27	279,057	493,242	37	9.0	40
BARRIE	54,000	28	1,129,660	1,450,947	26	26.9	21
NORTH BAY	51,598	29	1,681,574	2,829,571	17	54.8	6
AJAX	51,150	30	693,000	1,242,800	29	24.3	23
WELLAND	46,500	31	200,396	572,560	34	12.3	37
TIMMINS	46,065	32	N/A	1,954,059	23	42.4	12
CORNWALL	45,529	33	555,402	1,990,688	22	43.7	10
NEWMARKET	40,000	34	194,905	812,103	31	20.3	28
KINGSTON TWNSP	38,000	35	N/A	86,900	43	2.3	45
BELLEVILLE	35,479	36	N/A	969,822	30	27.3	20
WOODSTOCK	27,000	37	218,856 *	395,045 *	38	14.6	34
STRATFORD	26,625	38	251,552	611,419	33	23.0	24
ORILLIA	24,000	39	150,000	550,000	35	22.9	25
BROCKVILLE	20,760	40	N/A	172,896	40	8.3	41
PEMBROKE	13,800	41	87,322	189,831	39	13.8	35
COBOURG	13,256	42	56,114	129,453	42	9.8	39
MIDLAND	12,500	43	31,072	73,119	45	5.8	44
COLLINGWOOD	12,196	44	N/A	76,259	44	6.3	43
KIRKLAND LAKE	12,000	45	45,300 *	133,171	41	11.1	38

* 1989 figures

Source: Canadian Urban Transit Association 1990 Operating Data

The list also illustrates that some municipalities find it very difficult to generate high levels of transit ridership; use of HOV measures to expand the shared-ride market and offer more options to those not using transit may be beneficial. Some smaller municipalities have achieved transit success, and can build on the obvious acceptance and support that transit enjoys in the community to take that "next step" which encourages all forms of HOV use; other municipalities of similar or larger sizes can look to them for inspiration.

Since circumstances vary considerably between small and larger communities, the municipalities on the list have been divided into four groups of common scope and interests, each with a different strategic focus:

- Population < 50,000: some HOV incentives may be of use, but these are unlikely locations for significant gains; these areas are not treated separately, but actions may be selected from the HOV "menu" (in Part III of this handbook) according to local needs and opportunities.

- Population 50,000 to 200,000, "Small Cities": mainly stand-alone urban centres, with some opportunities for HOV benefits; a strategy focused on HOV convenience incentives follows.

- Population 200,000 to 500,000, "Medium Cities": significant urban centres, with congestion problems and numerous HOV opportunities; the strategy is oriented toward developing "flagship" corridors upon which further improvements can be based.

- Population > 500,000, "Large Cities": major urban areas, with severe congestion problems and an overriding need for significant initiatives to improve transit and expand HOV use; absorption of HOV measures in an integrated, comprehensive transportation/land use strategy, leading to an HOV lane network, is the strategy outlined.

These groups have been defined as such solely for the purpose of discussing HOV strategies; in reality, all the HOV "menu" items are available to all urban areas, and selection of a package or group of measures that is appropriate to that community is the real goal of the process.

7.2/ Small City (Population 50,000 to 200,000)

In an urban centre of this size, with examples ranging from North Bay to St. Catharines, traffic congestion will likely not exist on the same scale as it does in larger centres. The downtown may exhibit congestion during the peak hours on key routes, and parking availability may be an issue. Other problem areas may be suburban arterials with strip retail development, or around major single generators such as a regional hospital, a college or university, a major employer, or a shopping mall.

Because commuting distances are short and parking and road congestion are not overwhelming issues, transit services tend to be used mainly by "captive" riders students, seniors, and those without a car. Low ridership in turn reduces the ability to provide frequent service to the entire community.

In general, the commuting trips are not long enough, congestion is not severe enough, and parking is not enough of an issue for HOV lanes to provide a time saving significant enough (5-10 minutes) to begin inducing a modal shift. This is not to say that no benefits can be derived from bus or carpool priority measures, but that they could not be relied upon to induce significant changes in the areawide travel pattern.

In these circumstances, HOV use will not be driven by time savings, but more by convenience and, if use of a second family vehicle can be avoided or rarely used, cost savings.

The recommended approach for a small city would therefore focus on employer-based programs, HOV marketing, convenience-oriented low-cost measures such as parking priority, and small-scale pilot projects acting as "statements" of HOV priority.

A unique opportunity in a smaller centre is the potential to bring together many of the key players in the transportation arena and build a *community-based* consensus as to the desirability of an HOV program and the various methods and responsibilities for carrying it out. Since the "technical" justification for many infrastructure-type HOV measures will likely be marginal in most areas, it is imperative that HOV incentives be approached from a policy direction – "the right thing to do" – and that they gradually become a basic part of life in the community, rather than being imposed solely as a traffic congestion relief measure.

This will require sensitivity, leadership, commitment, and flexibility on the part of local government and business leaders, but promises the reward of an improved quality of life, a convenient, accessible transportation system, and strong community support for the integration of land use and transportation planning.

Of the specific measures outlined in this report, the following groups provide a reasonable starting place to begin considering each municipality's needs and opportunities;

***Initial Action*:** Establish an HOV Forum for all interested parties - assess needs, review opportunities, define responsibilities.

Activity Group 1: Starting an HOV Program

a) *Employer (Private) Initiatives*
- employer incentives
- ridematch service
- guaranteed ride home
- preferential parking space

b) *Public Sector Measures*
- bus service improvements
- carpool parking lots
- queue bypass lane
- park and ride lot

Activity Group 2: Building on Success

- express bus service
- vanpool program
- marketing
- preferential parking fee
- enforcement
- parking bonuses

Activity Group 3: Community Commitment to HOV

- arterial HOV lane
- bus street in downtown
- Transportation Management Associations (TMAs)
- information services

7.3/ Medium City (Population 200,000 to 500,000)

There are approximately a half dozen medium-sized cities in Ontario (e.g., Windsor, Brampton, London), with a few others exhibiting growth potential to this category in the medium-long term. Many of these cities are the main urban centres for a large region, and begin to exhibit the "critical mass" in terms of congestion, travel demand, employment growth, and transit use that can support and/or warrant a substantial HOV program. In some, the provincial freeway system plays a role but its use is generally oriented to intercity travel rather than commuter trips.

The technical support for HOV measures being stronger than in a small city in terms of potential time savings and modal shift, it is better for medium cities to focus on "flagship" projects that can serve as catalysts to the development of broader community support. This allows packaged incentive measures to be focused to generate specific significant benefits to HOV users, thereby giving a marketing program something "real" to build on. This more aggressive strategy would help the city avoid scattering its resources on initiatives that, by themselves, do not create enough of a benefit to begin inducing a modal shift.

For a medium city, therefore, the public sector needs to work together with selected major employers to identify and implement a "test bed" corridor or two, from which the

lessons learned can be applied to other zones and to extentions of the system. Areawide programs such as ridematching can come into service early on, since they provide benefits and visibility over the long term in any case.

Moderate transit volumes, short community trips, and limited levels of congestion in peak periods will not likely produce conditions that warrant HOV lanes in more than a few major corridors and/or in the downtown. An HOV "network plan" is therefore not likely to be necessary. The downtown area will generally be sizable enough, however, that selected lanes or blocks can be taken out of mixed-flow service at least during peak periods without significantly affecting the net capacity of the downtown street system. For example, a lane could be dedicated to HOVs in the morning peak period and used for on-street parking at other times.

As with any size of community, when a "new" set of initiatives such as HOV incentives are being developed, a forum should be established where key players can come together and discuss their needs and interests; such a public/private group could be formally struck as an "HOV strategy implementation group" and be charged with overseeing and taking responsibility for an effective long-term plan. Since HOV initiatives are only part of the transportation solution, a key aspect of an effective community HOV strategy is the ability to plan and implement measures in an integrated way with new developments, community lifestyles, retrofit opportunities, transit issues, and overall planning goals.

The stages of HOV development are therefore different from those of smaller centres, with an earlier emphasis on on-line provisions in key corridors. For a medium-sized city, the following groups of incentives would be an appropriate "menu" to choose from:

Initial Action: Establish an HOV Forum for all interested parties – assess needs, review opportunities, define responsibilities

Activity Group 1: Establish an HOV Presence

- employer incentives
- preferential parking spaces
- park and ride lot
- carpool parking lot
- express bus services
- arterial HOV lane
- enforcement
- marketing

Activity Group 2: Expand and Exploit the Market

- ridematch program
- guaranteed ride home
- transportation management associations
- vanpool program
- bus street in downtown
- queue bypass lane
- information services

Activity Group 3: Integrated Transportation System

- freeway transit interface
- signal operations
- freeway HOV lane

7.4/ Large City (Population 500,000)

There are three large urban centres in Ontario: Ottawa-Carleton (plus Hull, etc. in Quebec); Hamilton-Wentworth; and the Greater Toronto Area (GTA). The latter incorporates several municipalities with populations of ±500,000, each with distinct and occasionally overlapping needs and strategies – Mississauga, York Region, Scarborough, Peel Region, and the City of Toronto are examples. Although many of the areas of responsibility for HOV-related actions lie with the regional level of government, there are cases (e.g., in Mississauga and the City of Toronto) where the local municipality takes a leading role.

In this document, the case of Metropolitan Toronto will not be specifically addressed, as it has developed, and is in the process of implementing, a comprehensive HOV network plan as well as related transit and carpool incentive programs. Similarly, Ottawa-Carleton has a detailed and comprehensive transportation and land use strategy in place that emphasizes transit priority measures and facilities such as the Transitway system. However, in that there are many HOV-related initiatives and opportunities that have not been identified or acted on in all large Ontario municipalities, the following discussion and examples will be of significance to large centres new to the HOV field, and will supplement the measures already in place in other municipalities that have a "head start" or that focus solely on the transit aspect of the HOV market.

In centres of this scale, severe recurring congestion, long commuter trips, the presence of both downtown and suburban employment activity centres, dense concentrations of homes and jobs, and large-scale transit operations are typically present. All of these conditions indicate significant HOV market potential; increased bus use and higher auto occupancy rates may indeed be crucial to the ability to maintain personal mobility while continuing to grow and prosper as a community.

The demands placed on the transportation systems in large centres are likely to result in the system having been expanded to its physically maximum size already, or in plans having been developed to complete the system. In this context, it is of great importance to both take advantage of scarce opportunities (in terms of road widenings, etc.) and to ensure that last-chance opportunities (such as widening a major arterial to its ultimate cross-section) are not missed without a review of their potential HOV role.

The extent of the urban area, the severity of congestion, and the comprehensiveness of the transit system in large centres indicate that a network plan should be developed and that the integration of transit, roads, and land use planning should reflect the common goals of increased transit use and auto efficiency. In the case of the GTA, the extension and joining of municipal initiatives across political borders to form a seamless areawide effort would be preferable to adjacent yet uncoordinated initiatives. The provincial freeway system, with its associated HOV opportunities, is likely to play a key role in large urban centres. The evolution of Highway 403 in Mississauga as a people-moving corridor is an example of joint municipal-provincial planning, encompassing freeway bus lanes, freeway HOV lanes, park and ride lots, ridesharing services, express bus operations, bus-only transitway links and stations, HOV ramps, and parking incentives. The roles of the two levels of government in such a case cannot be separated, nor, given the key funding role the Ministry of Transportation plays in the development of municipal roads and transit systems, can one proceed in isolation of the other in almost any situation in Ontario. Development of an areawide HOV strategy should therefore be municipally driven but incorporate both MTO facilities and concerns through direct participation and cooperation.

For a large centre, significant HOV benefits can be generated by the physical on-line facilities, in contrast to smaller centres. These benefits (time, cost) directly reward users and are extremely visible and therefore act as the most effective inducement to non-HOV users to shift modes. The emphasis should be therefore to get HOV projects "on the ground" at an early stage and develop them in a network context as additional opportunities arise. A more comprehensive approach can be taken than in medium-sized cities, as "pilot projects" can be located in a variety of areas and incentive programs can rapidly achieve the "critical mass" which will allow them to become self-sustaining. Furthermore, a network-type framework will allow justification of each arterial HOV segment in a larger context, thereby avoiding the trap of analyzing each element as a stand-alone proposal where the HOV time savings may not be great enough to warrant HOV treatments. The Metro Toronto HOV Network is a good example of this strategy.

Some employer-oriented measures such as vanpool programs may be less necessary in large centres, given the effectiveness of transit service; others may play a much stronger role (e.g., Transportation Management Associations). Conversely, the ability to offer incentives to developers and employers is often stronger in a large centre, where the magnitude of potential benefits makes them worthwhile to pursue.

The greater need to implement HOV infrastructure rather than HOV programs implies a higher short-term capital expenditure in a large city. Funding and joint private/public activity therefore become important considerations. Although HOV lanes themselves may fall under a traditional public road works funding umbrella, there are several potential areas that may be considered for private/public cooperation:

- employer incentive programs – mandatory, voluntary, or cooperative
- ridematch organizations – options include public, private, transit agency-operated, and non-profit arrangements
- property trade offs – e.g., easement for a bus bay balanced against reduced parking requirements in a new development
- joint marketing efforts
  - sponsored advertising
  - billboard/transit shelter use
  - electronic information systems
- turnkey development of park and ride/transit terminal facilities
- transitway/terminal air rights development
- shared use of parking lots for carpool, park and ride purposes in peak periods – e.g., shopping centres, churches, sports complexes, cinemas, etc.
- commercial advertising on HOV information services/brochures
- private parking authority
- toll roads with HOV lanes
- constituency-building between environmental/transportation interest groups, government, employers, developers, transit agencies, TMAs
- Intelligent Vehicle/Highway System pilot projects and test cases
- others, per context

For a city of over 500,000 residents, then, an HOV strategy should be developed by the local transportation authority and implemented in phases, beginning with some key arterial improvements and expanding from these. In order to sustain the momentum created by the first project(s), there should not be a long delay while the application is monitored and analyzed; rather, a commitment to a continuous, growing, flexible program should be made in the initial stages, and HOV incentives should gradually

and inevitably spread to every sector of the market in a continuous, regular, visible manner. The following activity groups illustrate the types of measures larger cities should be considering in developing an HOV strategy:

Initial Action: Establish HOV incentives as a guiding principle of municipal transportation and planning strategy

Activity Group 1: Utilize Opportunities

- *employer incentives*
- carpool parking lots
- park and ride lot
- marketing
- arterial HOV lanes
- express bus service
- freeway transit interface
- freeway bus lane
- enforcement

Activity Group 2: Consolidate Initiatives and Firmly Establish HOV Plan

- queue bypass lane
- freeway HOV lane
- HOV-only direct ramp
- Transportation Management Associations
- parking bonuses
- ridematch program
- guaranteed ride home

Activity Group 3: Refinement, Expansion and Optimization

- bus street
- bus-only transitway
- signal operations
- information services

PART III

MUNICIPAL HOV ACTIONS

8/ HOV Priority/Incentive Measures – Applications, Design Guidelines, and Examples

This section of the handbook is intended to act as a reference source and primer for all of the HOV incentive measures, facilities, and programs that would be reasonable to consider in Ontario municipalities.

It is laid out in "menu" format, with each incentive measure given a description of typical applications, basic design guidelines, and an indicator of costs and benefits. Several "real-world" examples are given for each measure, drawn where possible from recent relevant North American experience. By necessity, the examples cited are selective and are in many cases only a small proportion of those available.

For clarity and ease of reference, each measure is dealt with individually; consequently strategic planning issues such as the development of a network of HOV lanes are not specifically dealt with, although all of the elements of such a strategy are presented. Once a municipality has reviewed the incentive measures available and considered their potential application in the local context, a strategic study would be required to develop an integrated and comprehensive program appropriate to that community. In that study, the interrelationships, staging opportunities, and cost-effectiveness of various HOV measures, either alone or in combination, may be fully explored.

The HOV measures are separated, for ease of reference, into four functional groupings:

Group 1: Convenience/Encouragement

These initiatives mainly involve employers and governments providing programs and services aimed at increasing the convenience and benefits of HOV use. They do not depend on the presence of HOV lanes, and can be undertaken at any scale (employer-specific to areawide). The direct benefits can be significant in targeted locations, and capital costs are relatively low.

Group 2: Parking

One of the greatest determinants of auto use (single occupant or multiple occupant) and hence transit use is the availability, cost, and convenience of parking. Several low-cost techniques can be used to give HOVs priority treatment with respect to parking. Site-specific and areawide opportunities exist.

Group 3: Operations/Services

"Fine tuning" of existing transit service and traffic control systems can be done in such a way as to ensure HOV priority and to enhance HOV alternatives.

Group 4: On-Line Physical Facilities

The most important part of a trip is the actual movement between origin and destination; a wide range of HOV-specific line-haul facilities can be provided to ensure a fast, reliable, safe trip for HOV users. While infrastructure capital costs may be high in some cases, there are several ways of utilizing pre-existing infrastructure. On-line measures are generally the most visible and most effective means of encouraging HOV use.

GUIDE TO THE HANDBOOK

HOV INCENTIVE each incentive type is listed separately

PLAN a "typical" urban area is used as a base on which to illustrate where the incentive would most likely apply

ACTION

Key steps towards implementing a measure are outlined.

APPLICATIONS

The most common applications elsewhere, and those holding the most promise in typical Ontario situations are highlighted

BENEFITS / COSTS*

Basic order-of-magnitude figures are given, based on experience in Ontario and elsewhere (see below)

DESIGN GUIDELINES

Experience-based guidelines for successful implementation and operation are given. Reference is made to additional sources of information where necessary. Basic "typical" guidelines are given; actual design is usually project-specific, combining experience elsewhere with local needs and opportunities.

EXAMPLES

Two, three, or four practical examples of successful, operating HOV incentive measures are illustrated and described. Examples are selected from projects world-wide which hold some direct relevance to the Ontario situation, or which serve as "classic" HOV applications. Where possible, operating data and experience is shown.

Each example includes a related illustration, in order to help visualize the measure and to ground it firmly in reality. Credits for photos and other material used are listed at the end of the handbook.

*** BENEFIT / COST RATINGS:**

Market Reach: proportion of potential HOV market directly affected	existing bus riders or carpoolers only	-
	existing bus riders and carpoolers	✓
	encourage potential HOV users	✓✓
	discourage SOV users	✓✓✓
Time Saved by User per trip:	Slower trip	-
	approximately 0 - 1 minute	✓
	1 - 5 minutes	✓✓
	> 5 minutes	✓✓✓
Savings by User per trip	Approximately $ 0 - $ 0.50	✓
	$ 0.50 - $ 2.50	✓✓
	> $ 2.50	✓✓✓
Convenience to User	inconvenient	-
	neutral	✓
	fairly convenient	✓✓
	very convenient	✓✓✓
Capital Cost to Proponent	Approximately $ 0 - 10,000	✓✓✓
	$ 10,000 - 100,000	✓✓
	> $100,000	✓
Ongoing Cost to Proponent per year	Approximately $ 0 - $ 10,000	✓✓✓
	$ 10,000 - 50,000	✓✓
	> $ 50,000	✓

INDEX TO INCENTIVES AND EXAMPLES

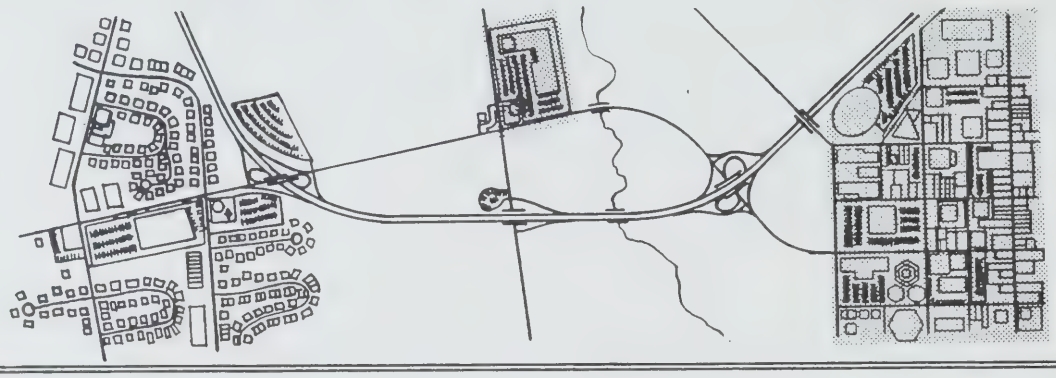
Group	Measure	Example
1. CONVENIENCE / ENCOURAGEMENT	1.1 Employer Incentives	a) Mutual Life, Waterloo, Ontario b) Parsons Brinckerhoff Quade and Douglas, Orange, California
	1.2 Ridematch Program	a) MTO Share-a-Ride Program b) MTO Ridesharing Centre Study c) Commuters' Register, Connecticut
	1.3 Vanpool Program	a) Vanpool Programs in Ontario b) Chrysler Corporation c) Metro Seattle
	1.4 Guaranteed Ride Home	a) Seattle b) Southern California (Various)
	1.5 Marketing	a) B. C. Transit, Vancouver b) I-394, Minneapolis c) Banfield Expressway, Portland, Oregon
	1.6 Information	a) CFYZ - Pearson Int'l Airport b) MTO COMPASS c) R.W.I.S. - MTO
	1.7 Trip Reduction Plans	a) Silver Spring, Maryland b) San Diego, California c) Pleasanton, California
	1.8 Transportation Management Associations	a) North York, Ontario b) Survey of U.S. TMAs
2. PARKING	2.1 Park and Ride Lot	a) Ottawa, Ontario b) Leased Lots, Seattle c) Pinemont Lot, Houston
	2.2 Carpool Parking Lot	a) Freeways, Ontario b) Municipal Lot, Seattle c) Church, Houston
	2.3 Preferential Parking Spaces	a) GO Transit b) MTO, Downsview c) Seattle
	2.4 Preferential Parking Rates	a) Minneapolis b) Commuter Transportation Services, Los Angeles
	2.5 Parking Bonuses	a) Ottawa b) Toronto Area Municipalities
3. OPERATIONS AND SERVICES	3.1 Express Bus Service	a) Ottawa b) GO Transit c) Mississauga

INDEX TO INCENTIVES AND EXAMPLES

Group	Measure	Example
3. OPERATIONS AND SERVICES (Cont'd)	3.2 Signal Operations	a) Metered Freeway Ramps, Minneapolis b) Albert / Slater Streets, Ottawa c) Southwest Transitway, Ottawa
	3.3 Enforcement	a) Fines for Occupancy Violations b) "HERO" Program, Seattle c) Pullover Bays, Toronto
4. ON-LINE PHYSICAL FACILITIES	4.1 Freeway HOV Lane	a) I-15, San Diego b) S.R. 55, Orange, California c) I-5, Seattle d) I-405, Seattle
	4.2 Freeway Bus Lane	a) Highway 17, Ottawa b) Champlain Bridge, Montreal c) Route 495, New Jersey
	4.3 Arterial HOV Lane	a) Dundas Street West, Mississauga / Etobicoke b) Boul. Maisonneuve, Hull, Quebec c) San Tomas Expressway, Santa Clara, California
	4.4 Arterial Bus Lane	a) Bay Street, Toronto b) Allen Road, Toronto c) Boul. Pie-IX, Montreal
	4.5 Bus-Only Roadway (Transitway)	a) Ottawa b) Runcorn, England c) Adelaide, Australia
	4.6 Bus-Only Street (Transit Mall)	a) Rideau Street, Ottawa b) Bank Street, Ottawa c) Granville Street, Vancouver
	4.7 Queue Bypass Lane	a) Toll Plaza, San Francisco b) Ramp Meter, Ontario c) Ferry Terminal, Seattle
	4.8 HOV-Only Direct Ramp	a) US 290, Houston b) I-95, Miami c) I-91, Hartford
	4.9 Freeway Transit Interface	a) Queensway Station, Ottawa b) SR 405, Seattle c) Ontario Standard

CONVENIENCE / ENCOURAGEMENT

HOV INCENTIVE: Employer Incentives 1.1



ACTION

- commitment to philosophy of reduced vehicle use at the top management / CEO level
- support to employers (training, materials) by government / areawide HOV agency / program
- define available incentive measures and implement through Employee Transp. Coordinator
- Develop program together with employees, transit agency, and other building / area employers

APPLICATIONS

- large employers (>100± staff)
- if severe parking problems exist, either on-site or within a defined are (office park, downtown, etc.)
- as part of areawide Trip Reduction Program, for air quality / congestion reasons (e.g. Los Angeles)
- to avoid / defer more costly alternatives, such as building structured parking
- as cooperative employee / employer / transit agency / municipal venture to achieve mutual goals

BENEFITS AND COSTS

Market Reach:	✓✓✓
Time Saved:	✓
Cost Saved:	✓✓
Convenience:	✓✓
Capital Cost:	✓✓✓
Ongoing Cost:	✓✓✓

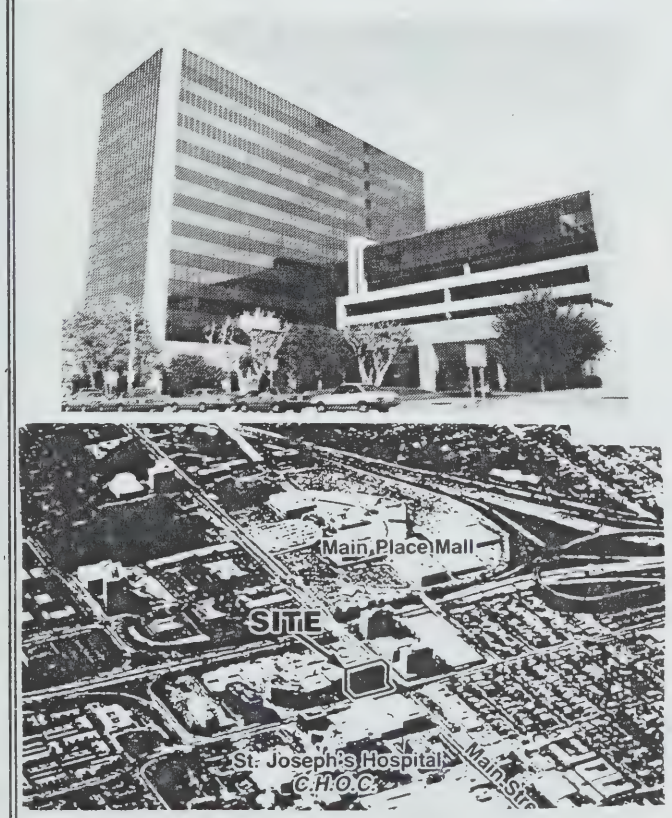
DESIGN GUIDELINES

- generate support among employer and employees
- define responsible person / office for permanent, sustainable program
- regular information updates to employees
- "tailor" incentives to needs and opportunities, as defined by users
- require "real" incentives - financial, time, convenience, or otherwise
- cannot have single occupant use disincentives without available HOV alternatives
- discuss needs, opportunities with transit operators
- utilize available ridematching (e.g. MTO) and other programs
- ensure confidentiality of ridematching information
- parking availability and pricing is most significant factor
- join / form building or areawide Transportation Management Association to share costs, expertise, marketing

Photo N/A

Mutual Life of Canada, Waterloo, Ontario

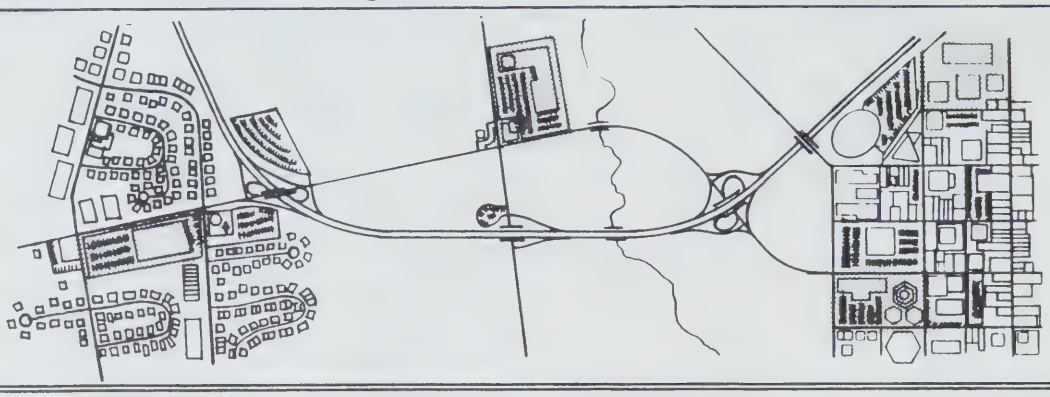
- 2170 office employees
- incentives intended to alleviate parking problems;
- benefits include energy savings, reduced congestion, improved morale
- vanpool program initiated October 1980; 7 vans in use
- 1100 space parking lot (inside and outside)
- priority spaces reserved for 3+ car / vanpools upon request
- $6 / week parking fee (deducted from pay) for drive-alone users; $1.50 each / week parking fee for 2 person carpools (160 currently registered); free parking for 3+ carpools (32 registered)
- self-enforcement; tag on rear view mirror indicates carpool status
- ridematch maps posted at cafeteria (coloured pins showing riders / drivers)



Parsons Brinckerhoff Quade & Douglas, Orange, California

- 150 person engineering office
- suburban office setting
- incentive program created in response to areawide trip reduction ordinance for large employers (>100) due to air quality standard non-attainment.
- incentives:
  - information re: transit, ridesharing, commuting
  - Guaranteed ride home for car / vanpoolers
  - bicycle storage area
  - in-office postal services (to reduce need for "convenience" trips
  - company car available for meetings
  - Employee Transportation Coordinator appointed
  - lottery among HOV users for cash, extra vacation day
  - bonuses: walk/bicycle = $25/month
    transit pass = $21/month
    2 person carpool = $1/day
    3+ car/vanpool = $1.50/day
    turn in parking pass = $50/month

HOV INCENTIVE: Ridematch Program 1.2



ACTION

- define agency / group responsible (public, private, nonprofit, transit, or combination)
- determine funding arrangements (governments, employers, users)
- set up areawide and / or localized office, and ridematch software / database
- marketing and publicity

APPLICATIONS

- major employment area not adequately served by transit
- area / regionwide program
- single major employer (>200 employees)
- in association with HOV lane implementation
- in association with preferential parking program at major parking lot / park and ride centre

BENEFITS AND COSTS

Market Reach: ✓✓

Time Saved: N/A

Cost Saved: N/A

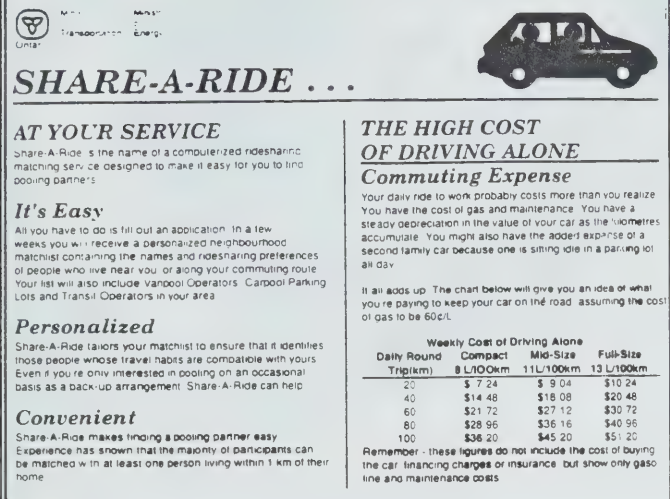
Convenience: ✓✓✓

Capital Cost: ✓✓✓

Ongoing Cost: ✓✓✓ - ✓✓

DESIGN GUIDELINES

- ridematch software and forms available from MTO Transportation Energy and Productivity Office
- link program to specific incentive measures, such as priority parking spaces, HOV lanes, carpool or park and ride lots, etc.
- supplement with Guaranteed Ride Home program
- emphasize personal safety, cost savings, convenience, reliability, and confidentially of information
- program can be operated by Transit agency (B.C.; Portland, Ore; etc.), by government (MTO), by employers (see T.M.A.s), and / or by private / non-profit corporation
- ensure market awareness through publicity and via employers



Ministry of Transportation Ontario

SHARE-A-RIDE . . .

AT YOUR SERVICE

Share-A-Ride is the name of a computerized ridesharing matching service designed to make it easy for you to find pooling partners.

It's Easy

All you have to do is fill out an application. In a few weeks you will receive a personalized neighbourhood matchlist containing the names and ridesharing preferences of people who live near you or along your commuting route. Your list will also include Vanpool Operators, Carpool Parking Lots and Transit Operators in your area.

Personalized

Share-A-Ride tailors your matchlist to ensure that it identifies those people whose travel habits are compatible with yours. Even if you're only interested in pooling on an occasional basis as a back-up arrangement, Share-A-Ride can help.

Convenient

Share-A-Ride makes finding a pooling partner easy. Experience has shown that the majority of participants can be matched with at least one person living within 1 km of their home.

THE HIGH COST OF DRIVING ALONE

Commuting Expense

Your daily ride to work probably costs more than you realize. You have the cost of gas and maintenance. You have a steady depreciation in the value of your car as the kilometres accumulate. You might also have the added expense of a second family car because one is sitting idle in a parking lot all day.

It all adds up. The chart below will give you an idea of what you're paying to keep your car on the road, assuming the cost of gas to be 60¢/L.

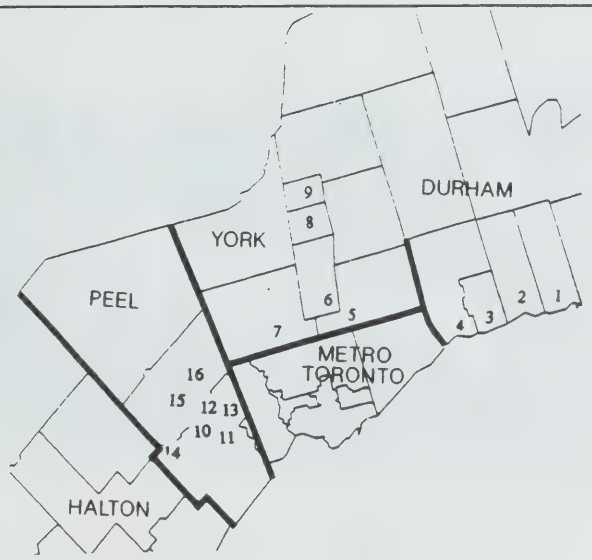
Weekly Cost of Driving Alone

Daily Round Trip(km)	Compact 8 L/100km	Mid-Size 11L/100km	Full-Size 13 L/100km
20	$ 7.24	$ 9.04	$10.24
40	$14.48	$18.08	$20.48
60	$21.72	$27.12	$30.72
80	$28.96	$36.16	$40.96
100	$36.20	$45.20	$51.20

Remember - these figures do not include the cost of buying the car, financing charges or insurance, but show only gasoline and maintenance costs.

Share-A-Ride Program, MTO, Toronto

- "generic" ridematch program, implemented at MTO head office in 1970s and promoted for use by government agencies and private employers
- currently in use by Toronto Board of Education, Hewlett Packard, Garrett Manufacturing, University of Waterloo, Ontario
- similar program implemented in Fall 1991 by B.C. Transit as a pilot project, in association with preferential parking for carpools at the Scott Road Skytrain Park and Ride Lot in Surrey



Potential Rideshare Centre Locations in the Greater Toronto Area

- MTO Ridesharing Centre Strategy Study
- carried out in 1990-91
- focus on Greater Toronto Area
- summarized previous experience, identified 17 areas of optimum ridesharing potential, and recommended pilot project location(s)
- initial pilot project to be implemented in Mississauga
- suburban employment nodes (major employers, business parks, etc.) of 2,000-38,000 employees targeted
- large employers (>200) and poor transit service / low modal split were indicators of high rideshare potential

FREE OCTOBER

The Commuters' Register

SERVING CONNECTICUT, NEW YORK, NEW JERSEY, & MASSACHUSETTS

Volume 9 No. 8 A FREE MATCHING AND INFORMATION SERVICE FOR COMMUTERS October 1992

FEATURING

Saving gas translates into saving money and helping the environment

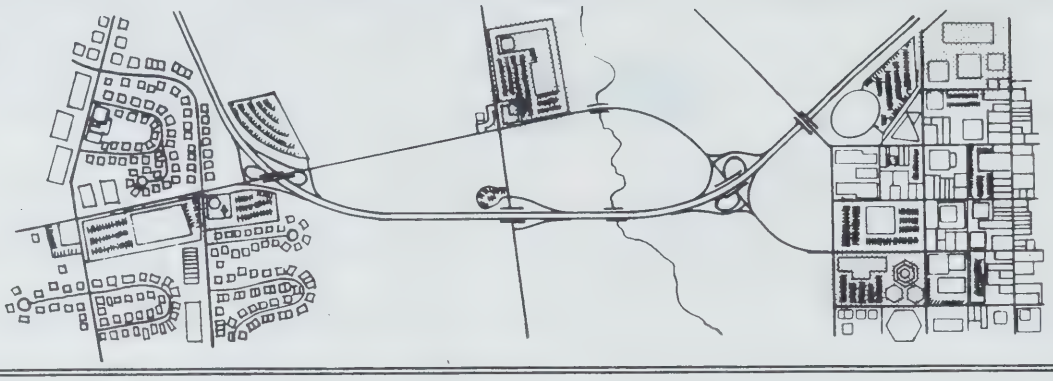
VANPOOL DRIVERS IN THE RIDESHARE COMPANY FLEET

THE ENVIRONMENT GETS A BOOST from vanpooling. See what all the "pooling around" is about on page 10

The Commuters' Register, Hartford / New Haven / Stamford, Connecticut

- free newspaper, published monthly by three nonprofit ridesharing brokerages
- serves market of 20 million± in 4 states
- 56 origin-destination zones
- 28 pages, listing scheduled transit (bus, train), carpools and vanpools being formed or seeking new passengers, individuals seeking a car / vanpool trip, locations of 230± park and ride lots, and commuter-related news and information articles
- funded by State, Federal and corporate contributions

HOV INCENTIVE: Vanpool Program 1.3



ACTION

- assess potential demand
- determine candidate routes
- assemble users and acquire van(s)
- implement supporting measures (priority parking, etc.)

APPLICATIONS

- where large employer relocates factory / office 20-100 km away from employees' residences
- as one element in a building / employer / area Trip Reduction / Rideshare Program (mandatory or voluntary)
- in response to employee request
- link rapid transit station(s) with suburban office park
- to reduce parking requirements at constrained site
- as supplement to scheduled transit service in small communities

BENEFITS AND COSTS

Market Reach: ✓✓

Time Saved: -

Cost Saved: ✓✓✓

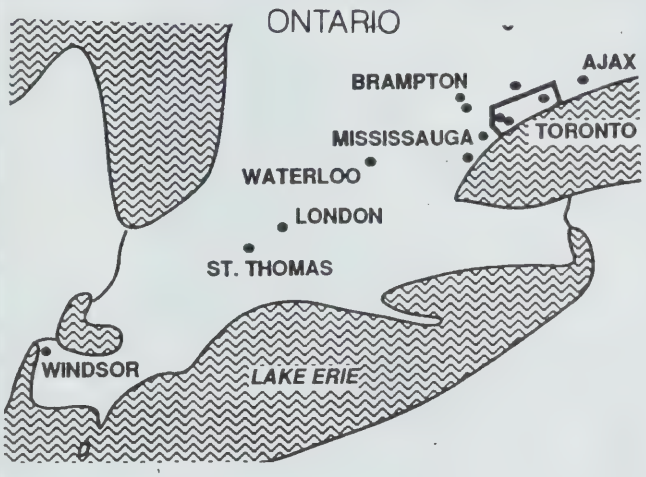
Convenience: ✓✓

Capital Cost: ✓✓

Ongoing Cost: ✓✓✓

DESIGN GUIDELINES

- refer to Transportation Energy and Productivity Office, MTO for guidelines, assistance
- employer to provide free program administration, vehicle for use, automatic payroll deduction for users, reserved / priority parking space for van, and support for insurance costs
- designate regular driver plus back-up; driver has free ride, personal use of van, and first right of refusal for van purchase
- driver skills course for driver is desirable
- determine concentration of employees on same shift commuting from common area; minimum trip length 15 km, typically 25 - 40 km
- provide back up service (Guaranteed Ride Home) if transit or ridesharing alternative not available
- initiate program as pilot project
- typical potential 1 van per 100 employees



Location of Vanpool Programs in Ontario (1989)

- 9 employers, 15 locations
- 169 vanpools in operation (1989)
- program size ranges from 1 to 79 vans per employer
- 3 companies own vans, 6 companies lease them
- estimated fuel savings 2 M ℓ/yr
- estimated reduction in veh. km of travel 18.8 M/yr
- estimated reduction in peak hour auto use 1080 veh/h
- average one-way commuting distance 43 km
- cited motivational factors: employee relations, company relocation, energy savings, parking problems
- cited benefits: favourable corporate publicity, reduced impact of relocation, improved punctuality, reduced parking congestion

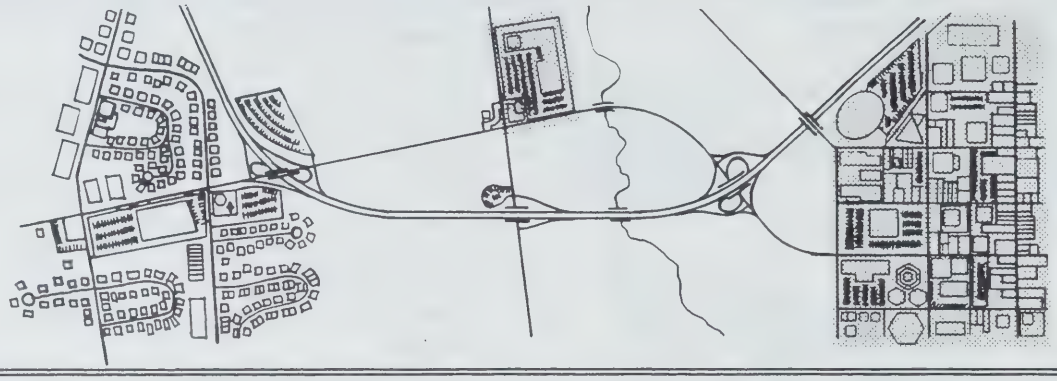
Chrysler Corporation, Ajax / Windsor, Ontario

- pilot program initiated April 1977; 10 vans
- 1989: 79 vans (17 Ajax, 62 Windsor) serving 11,000 employees (1800 Ajax, 9300 Windsor)
- motivation: parking problem, employee relations, save energy
- benefits: reduced parking congestion, favourable publicity, improved employee morale, slightly less absenteeism
- company provides administration, automatic payroll deduction for fares, personal use of vans, priority parking
- driver has free ride, unlimited personal use (beyond 160 km radius, permission req'd) with payment for gas, 50% of 11th fare
- back-up driver has free ride when driving, personal use of van with driver's permission
- vans acquired on 1 year lease and offered to driver, then other employees at end of lease
- est. operating cost 14.1¢/km (1989)
- shortest round trip 40 km, longest 170 km, average 70 km
- 11 M veh. km 1977-89; 2 accident claims (not at fault)
- liability insurance under company fleet policy; collision-comprehensive self insured

Commuter Pool Division, Metro Seattle

- operating division within metropolitan government began a public vanpool program in 1979
- 132 vanpools operating on 100+ routes in 1985
- mileage-based fares cover van purchase and operating costs
- employer-sponsored and individual vanpools also supported by Metro

HOV INCENTIVE: Guaranteed Ride Home 1.4



ACTION

- define goals and objectives
- outline program; develop in consultation with employees
- assign responsibility to Employee Transportation Coordinator
- publicize, implement, monitor and adapt to user needs

APPLICATIONS

- medium-large employers in Transportation Management Association
- part of areawide rideshare program
- as one part of any new rideshare promotion campaign
- to alleviate fear of being "stranded" (among the most commonly cited reasons for not car/vanpooling)
- as a response to a mandated or voluntary Trip Reduction Plan
- in response to employee interest
- to encourage shift to HOV use, and / or to retain current rideshares

BENEFITS AND COSTS

Market Reach: ✓✓

Time Saved: ✓✓✓

Cost Saved: ✓✓✓

Convenience: ✓✓✓

Capital Cost: ✓✓✓

Ongoing Cost: ✓✓✓

DESIGN GUIDELINES

- marketing, promotion is most important element; typically 2:1 to 5:1 ratio of marketing: direct costs
- for employers where unplanned overtime is rare, annual use is likely to be 0.5% - 8% of eligible ridesharers; up to 20% if more overtime occurs
- cost estimate based on average trip length of ridesharers x local taxi fare x projected use
- options include taxis (voucher or invoice), auto rental, company fleet vehicle, company driver, public transit
- consult with employees to define: written policy; who is eligible; what circumstances are valid for use; restrictions / limits on use (cost, distance, time); process; responsibility; cost to employees; payment methods; marketing plan; and monitoring

Seattle, Washington

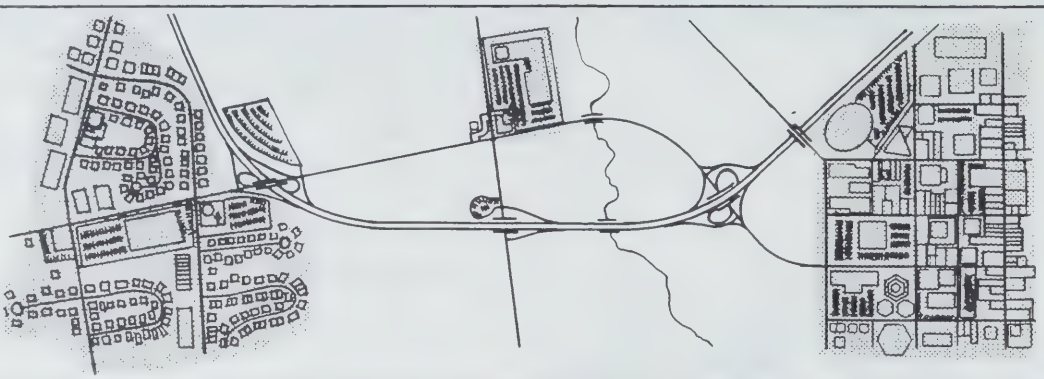
- 4,300 registered car / vanpool users
- 466 registered for Guaranteed Ride Home program
- 22 month test period - 41 registrants took 70 trips
- total cost: $1,300 for taxi fares, $2,000 administration

Warner Centre, Los Angeles, California

Southern California: various examples

- City of Pasadena: taxi voucher for ridesharing employees if illness, overtime, or emergency
- Huntington Memorial Hospital: HOV users issued voucher 4 x/year for taxi or rental car
- Mobil Oil Corp: company pays taxi fare for vanpoolers with emergencies, illness, or overtime
- Nissan Motor Corp: company fleet vehicle provided to eligible employees for emergency, unexpected overtime
- Burbank Studios: up to 4 times/year, vouchers can be used by registered ridesharers if their pool driver has to work > ½ hour overtime, or if driver is not available for return trip
- Xerox Corp: subsidized taxi ride for participating ridesharers up to 8 times/year
- Warner Center: taxi, rental car contracts (27,000 employees in Center, 6,000 ridesharers: 74 trips taken in first year of operation, direct cost $3,700, marketing / promotion (extensive, high quality) cost $15,000)

HOV INCENTIVE: Marketing 1.5



ACTION

- consult with marketing professionals (in-house, e.g. Public Affairs / Transit Marketing; or consultants)
- define goals of marketing program
- define target market
- assess most cost-effective means of reaching target market
- implement marketing program
- monitor market awareness and effect on desired action

APPLICATIONS

- ongoing activity to maintain / increase HOV modal share
- every HOV project or program
- initiation of a new HOV lane or program
- to build public (user and non-user) awareness of need, rationale, benefits, function of HOV facilities
- to support enforcement efforts
- areawide or site / project-specific
- as forum for communication of ideas, concerns, and interests between users and transportation providers

BENEFITS AND COSTS

Market Reach: ✓✓ - ✓✓✓

Time Saved: N/A

Cost Saved: N/A

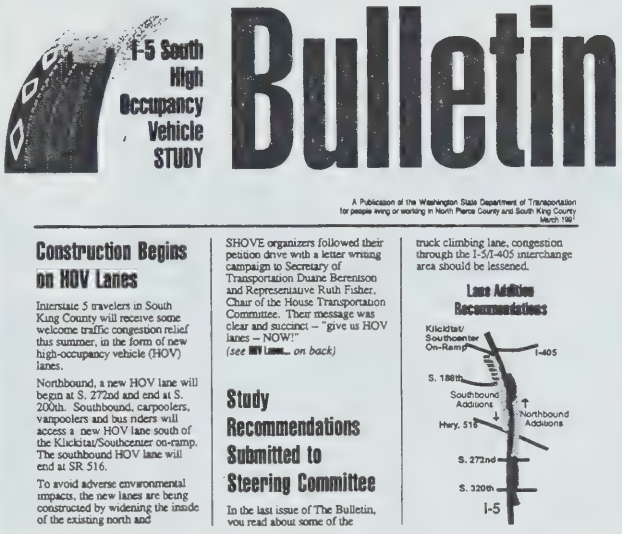
Convenience: N/A

Capital Cost: ✓✓

Ongoing Cost: ✓✓

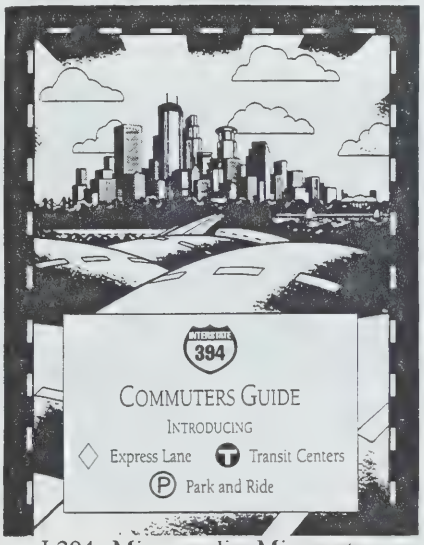
DESIGN GUIDELINES

- common methods of assessing market as input to designing marketing program are telephone interviews, focused interviews, self-administered questionnaires, focus groups, and case studies
- use random digit dialling for random (statistically significant) phone survey samples, since many numbers are unlisted (e.g. Seattle area - 4% of households have no phones; 31% have unlisted numbers)
- at 95% confidence, 400 respondents produce data ±5% and 1200 respondents produce data ±3%
- utilize news media to generate positive stories; news stories are worth 2x value of equivalent paid advertising
- target advertising / promotion efforts to specific market; one $10,000 sign in a congested road corridor is more effective at reaching potential HOV market than 10,000 $1 brochures mailed to area homes
- exploit all avenues of joint / cross-promotion, corporate sponsorship, median relations, special events, Public Service Announcements, coalition-building with interest groups, etc.
- develop a logo and / or "brand name" for HOV program (e.g. Metro Toronto's "Diamond Lanes")



I-5, Seattle

- periodic bulletin issued during study phase to residents, users of corridor
- update on study progress, new developments in corridor, means of public involvement
- one element in comprehensive publicity and public participation effort, expanding upon opening to include:
  - targeted mailing
  - employment site promotions
  - transit advertising
  - brochures / posters
  - targeted info to key media writers / announcers
  - public service announcements in newspaper, radio
  - letter to traffic courts, registered carpools, elected officials, study participants



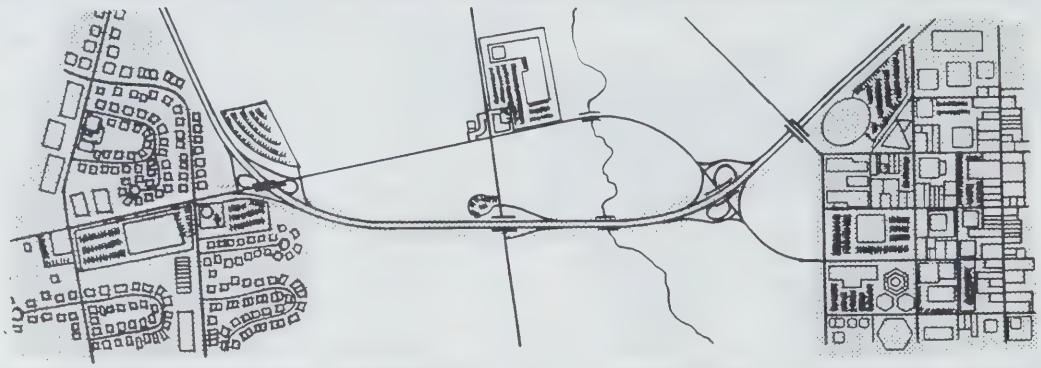
I-394, Minneapolis, Minnesota

- 12 panel, 2 sided, 2 colour brochure
- Minnesota Department of Transportation
- project is final product of multi-year reconstruction / upgrading of highway to freeway standards, including HOV lane, park and ride, downtown parking, and express buses
- brochure includes:
  - rationale for project and recommended solution
  - HOV lane description and user's guide
  - park and ride locations
  - carpool parking information
  - carpool, bus, road information sources
  - rideshare application form
  - map of freeway corridor and features
  - coupons for free carpool parking, bus travel
  - rideshare confidentiality commitment

Banfield Expressway, Portland, Oregon

- first HOV lane in Portland area (1975)
- 22 billboards used along major arterials in freeway service area; 11 billboards donated by advertising agency
- supplemented by permanent signs on highway ("for HOV information, call...")
- one element in multi-media strategy developed by transit agency, with support from state DOT and state / federal funding
- other marketing included:
  - slide show for major employers
  - press releases
  - 1,500 posters for CBD employers
  - 20,000 brochures handed out at freeway exit ramps (2x)
  - 5,500 brochures to CBD employees via hand delivery and inclusion in pay cheques
  - 3 weeks of radio commercials
  - TV commercials in "public service" slots
  - direct mail, ads in express bus catchment area

HOV INCENTIVE: Information 1.6



ACTION

- assess areawide and corridor-specific opportunities, utilizing all existing mechanisms
- initiate joint programs with MTO, municipalities, transit agencies, employers, developers
- put data-gathering, database, and monitoring systems in place
- publicize, implement pilot project(s), modify, and expand program

APPLICATIONS

- before trip, to affect decisions re: mode, time, route
- during trip, to optimize flow / avoid congestion
- HOV info (transit, ridesharing) as part of transportation information package
- any significant auto / transit trip generator: shopping centre, office building, parking garage, transit terminal
- individual access via phone, computer, TV, radio to current information
- pilot project for advanced telecommunications service, e.g. Intelligent Vehicle / Highway Systems

BENEFITS AND COSTS

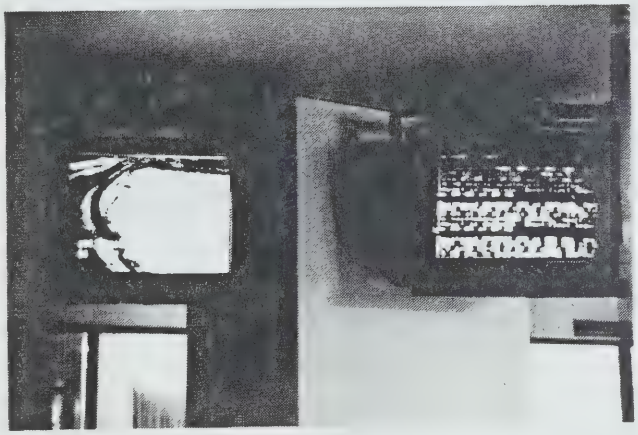
Market Reach:	✓✓
Time Saved:	N/A
Cost Saved:	N/A
Convenience:	✓✓✓
Capital Cost:	✓✓
Ongoing Cost:	✓✓

DESIGN GUIDELINES

- use all available media - audio, video, print
- adapt pre-existing systems to incorporate HOV information - MTO Freeway Traffic Management ("COMPASS"), transit agency phone lines, airport advisory radio, HOV marketing, rideshare programs, etc.
- for HOV formation / use, focus on home availability and convenience
- use electronic bulletin board for home computer, co-broadcast on cable TV, Highway Advisory Radio, rideshare / transit "instant" information by phone, etc.
- employer / work-related use can build awareness of HOV alternatives
- on-line, using Highway Advisory Radio and Changeable Message Signs can build awareness of HOV alternatives
- at transit centres / stops, use Telidon (per Ottawa Transitway) or automatic "next bus" phone lines (per Mississauga, others)

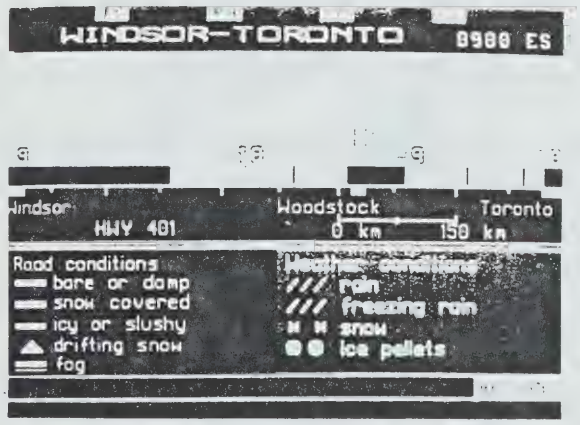
L. B. Pearson Int'l Airport, Mississauga, Ontario

- CFYZ Airport Information Radio
- 2½-4 minute long pretaped message re: airlines, terminals, parking availability, and unusual traffic conditions (if any)
- on-site low power transmitter with 7 km effective radius
- low production cost; professional announcers; bilingual message
- advisory signage on all freeway approaches to airport (4 locations total)
- concept is readily adaptable to HOV / traffic / transit information usage; MTO has studied Highway Advisory Radio feasibility for Toronto area



Atrium Tower, MTO, Downsview, Ontario

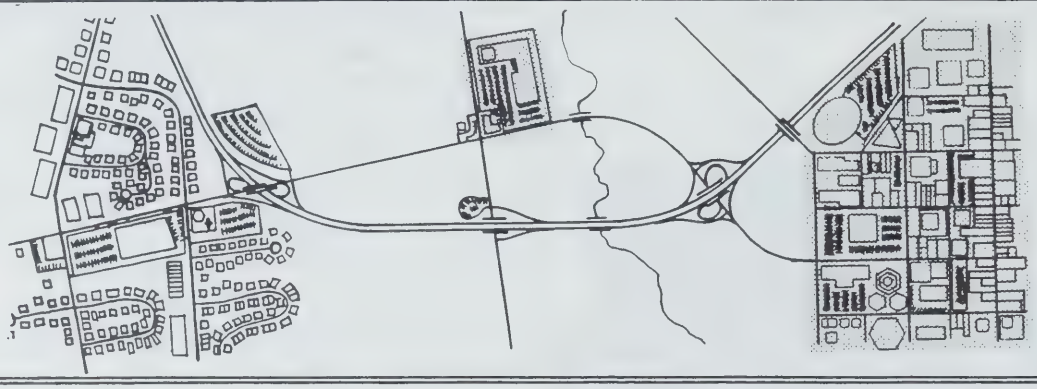
- two video monitors in office building lobby
- direct feed from COMPASS Highway 401 traffic management operations centre; one monitor providing closed circuit television "tour" of freeway, other monitor showing all posted incidents, delays, construction activity, etc.
- 16 km of urban freeway covered in initial system; to be expanded to all area freeways
- could be readily adapted for use in other buildings, homes, etc. and to show ridesharing, transit, and other relevant information



Road Weather Information System, MTO

- internal MTO monitoring system for weather and road conditions in 18 districts, covering all of Ontario
- shown on selected Cable Television weather channels (e.g. Toronto area)
- includes current weather, forecast weather, and road conditions
- vendor for non-MTO users is World Weather Watch, of Markham, Ontario
- system operated by Maintenance Operations Office, MTO

HOV INCENTIVE: Trip Reduction Plans 1.7



ACTION

- identify problem areas and assess costs and benefits of trip reduction options
- set up cooperative public / private interjurisdictional plan to reduce vehicle trips to area
- back up strategy or, if necessary, impose plan with planning / zoning controls and incentives / penalties

APPLICATIONS

- in severely congested or rapidly growing area where new development may overload transportation system capacity
- in conjunction with formation of Transportation Management Association
- during Secondary Plan develop / review process
- "triggered" by concern re: new / redevelopment impact during municipal approvals process
- mandated as Air Quality improvement

BENEFITS AND COSTS

Market Reach: ✓✓✓

Time Saved: N/A

Cost Saved: N/A

Convenience: N/A

Capital Cost: ✓✓✓

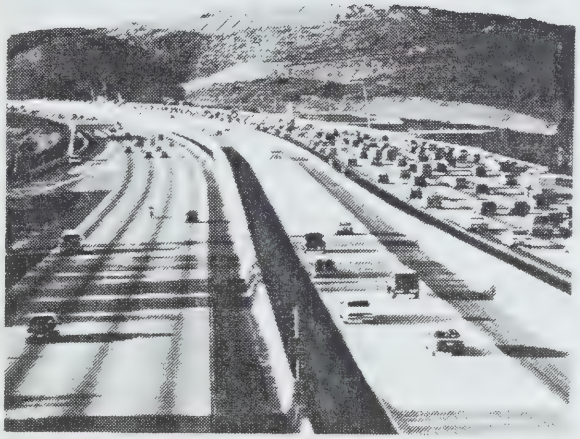
Ongoing Cost: ✓✓✓

DESIGN GUIDELINES

- plan must be tailored to the needs and opportunities of the subject area; select goals carefully
- proponent is municipal government; participation of employers and other levels of government is essential to success
- specific, definable, reachable targets should be set, e.g. am. peak period inbound modal split to HOVs at screenline "X" to increase to "Y" % by year "Z"; or all employers of > 100 employees are to achieve an "X" % a.m. peak period drive alone rate by year "Z"
- create positive inducement rather than penalties when working with employers
- responsibility of each party should be defined; an "Office of the Travel Reduction Coordinator" or some equivalent should be created to serve as a focal point, and its mandate and power should be clearly set out
- a joint employer / municipality Task Force can serve as a useful coordinating body
- link program with comprehensive set of other HOV incentives and priority measures

Silver Spring, Maryland

- revitalization of suburban centre constrained by available transportation infrastructure
- "Transportation Management District" (TMD) defined
- goal is to produce a 25% modal split to transit
- incentives: park-and-shuttle service, discount transit passes, discount parking for HOVs, 30% modal split commitment for new developments
- penalties: fines to employers who do not act "in good faith" to implement program, binding developer agreements, threat of mandatory actions if goals not achieved
- County controls parking supply in and around area
- municipal / citizen / business representatives on advisory board to oversee program



San Diego, California

- municipal Transportation Demand Ordinance passed in 1989
- all intermediate (>14) / large (>49) employers are to calculate an "Employee Drive Alone Rate" (EDAR) for a.m. peak period
- target site EDAR 1991-92 = 85%, reducing to 55% by 1995 (large employers) or by 1997 (intermediate employers)
- annual report filed with municipality
- EDAR "credits" for telecommuting, compressed work week, or non-peak travel
- employers can file EDAR reports as a group
- EDAR goal non-attainment for two consecutive years results in employer being required to formulate and file a Transportation Demand Management Plan
- developers of new commercial / industrial facilities must file a "Developer's TDM Plan", outlining the facilities, services, and parking management plans to be included in the development and which will support the employer TDM objectives; developer's plan is a condition of issuing discretionary permits

PLEASANTON

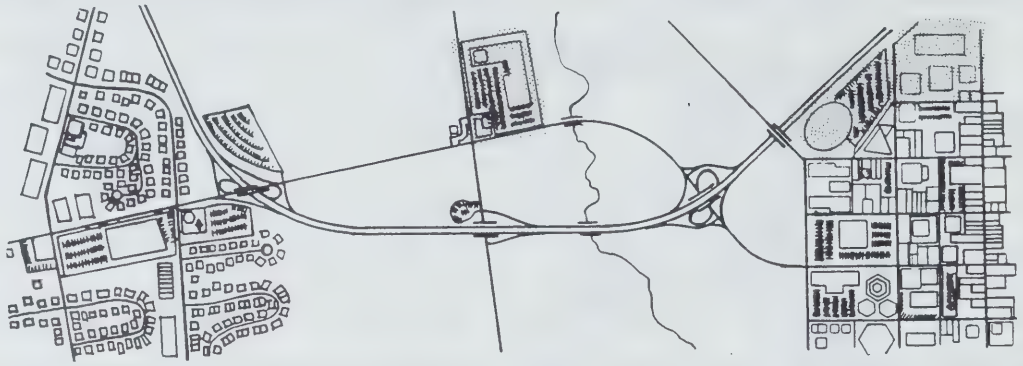
TSM PROGRAM

TRANSPORTATION SYSTEMS MANAGEMENT

Pleasanton, California

- first U.S. city with comprehensive Transportation Systems Management ordinance (October 1984)
- State Congestion Management legislation now requires all municipalities to produce local trip reduction ordinances
- most cost-effective measure determined to be reduction of employer-subsidized parking
- main goal was to control commuting traffic and associated congestion; objectives were to reduce peak hour (0730-0830, 1630-1730) vehicle trips by 45% and to maintain intersection Level of Service D
- 1991 results - 46% of employees commute off peak or use alternative (non-single driver) modes; 69% of major employers achieved TSM goals
- still auto-oriented: 86% drive alone, 10% car/vanpool, 2% transit, 2% bike/walk; main effect of TSM has been to shift auto commuting out of peak hour (i.e. earlier or later)
- TSM has not resulted in shift to HOV; drive alone rate among employees has risen from 81% in 1985 to 86% in 1992
- 75 large employers / complexes involved
- joint public / private Task Force meets quarterly to oversee program

HOV INCENTIVE: Transportation Management Associations 1.8



ACTION

- address and resolve interjurisdictional issues (municipal / regional / provincial) re: proponency, funding, planning coordination, and transportation servicing
- arrange a forum for municipal government, developers, employers, property managers, transit providers, and users to define common goals and most appropriate organizational mechanism
- define TMA mandate, funding, staff, and activities on a permanent / ongoing basis
- regularly evaluate effectiveness

APPLICATIONS

- where there exists or is anticipated to be a transportation problem (congestion, lack of accessibility, etc.)
- rapid growth high employment areas (suburban business / office / industrial parks, new urban centres)
- where rapid employment growth outstrips rate of provision of transportation systems and services
- where benefits can be gained from joint / cooperative action
- generally employment areas have greatest potential, but TMA could apply to residential neighbourhoods as well
- where transportation constraints preclude the ability to develop an employment area to its permitted / zoned / desirable density

BENEFITS AND COSTS

Market Reach: ✓✓

Time Saved: N/A

Cost Saved: N/A

Convenience: ✓✓

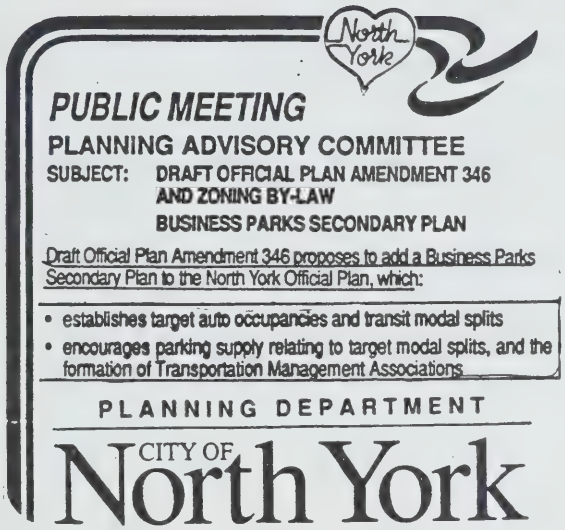
Capital Cost: ✓✓

Ongoing Cost: ✓✓ - ✓

DESIGN GUIDELINES

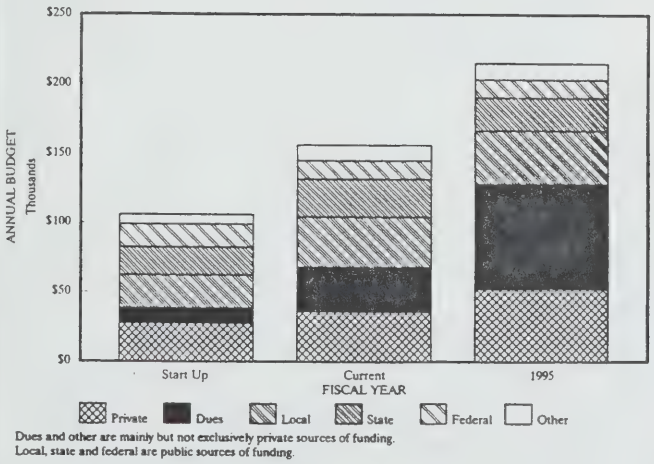
TMA Activities can include some or all of:

- forum for public / private consultation re: transportation service / infrastructure
- advocacy of TMA members' interests in public planning process
- fund raising for local transportation improvements
- public / private partnership to implement shared-cost improvements
- build local constituency for transportation issues
- develop, promote, and coordinate Demand Management programs, such as ridesharing, transit marketing, parking priority
- facilitate access to and circulation within area (shuttle buses, vanpools, etc.)
- provide member services (training, shared programs, promotion)



Public Notice (excerpt), North York, Ontario

- 4 major business parks have developed to approximately one third of their permitted density, but arterial roads leading to the parks are at or near capacity
- opportunities to increase density depend on increased auto occupancy and transit modal split
- of 351 businesses surveyed, 35% cited traffic as a significant negative aspect of their location, but only 17% provide transit subsides and 9% promote ridesharing / carpooling. 57% were not willing to provide subsidies for transit, and 15% were interested in TMA membership (35% unsure, 50% not interested)
- low density results in poor transit service, and banning of retail / service uses within business parks forces many to drive for lunch / shopping needs
- most infrastructure is not under local jurisdiction; creates need for interjurisdictional, public / private coordination
- new legislation required to allow municipality to initiate TMA and to set targets, encourage achievement, and enforce attainment
- municipality can control parking standards, but reduced standards are not desired by developers

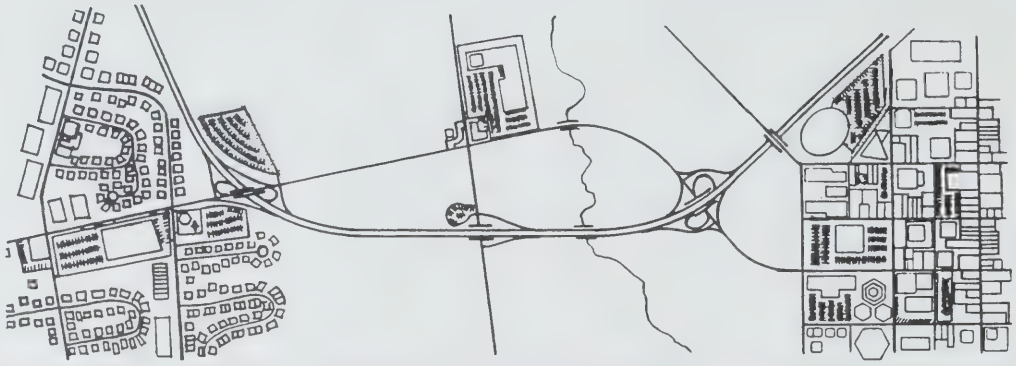


Average Budget and Funding Sources, 110 U.S. TMAs

- 1991 survey of 110 U.S. TMAs
- most TMAs are in suburban employment centres; average size 15 developers, 1,500 employers, 50,000 employees
- average TMA board of directors has 14 members, typically 8 private, 3 non-profit, and 3 public agency reps.
- 60% charge corporate membership dues; most often flat fee plus $1 - $10 per employee per year
- average 1.7 full time, 1 part time staff (typically director, manager, clerk)
- goals: Transp. Demand Management, Mitigation of Traffic Problems, Land Use / Economic Development, Transp. Supply Enhancement
- evaluation of effectiveness generally inadequate

PARKING

HOV INCENTIVE: Park and Ride Lot 2.1



ACTION

- identify suitable locations, reflecting existing demand, available property, and transit service
- implement prior to or in conjunction with transit service / facility

APPLICATIONS

- on fringe of downtown, with shuttle bus / walkway links
- on fringe of activity centre (e.g. airport), with shuttle bus
- at major transit station or node
- at all termini of fixed transit services (subway, transitway, etc.)
- to relieve congestion on route to activity centre, or in parking within the centre
- in association with priority transit lanes and express buses linking parking area with activity centre
- to build up transit usage prior to introduction of fixed transit facility in corridor

BENEFITS AND COSTS

Market Reach: ✓✓

Time Saved: - ✓

Cost Saved: ✓✓

Convenience: ✓✓

Capital Cost: ✓

Ongoing Cost: ✓

DESIGN GUIDELINES

- locate either on fringe of activity centre (w/shuttle bus) or a minimum of 7 km± upstream of activity centre on major transportation artery
- good auto accessibility and visibility; adequate storage space for entry / exit queues
- direct (non-circuitous) transit routing, including necessary link roads / ramps to allow express buses on major route to serve lot with a minimum of delay; alternatively, terminate all routes at park and ride lot, and transfer to express buses originating there
- maximum walking distance within lot 450 m
- ratio of pedestrian walking distance within lot to straight-line distance (i.e. from car to bus stop) not to exceed 1.4
- provide illumination, security, signage, drainage, landscaping, sheltered waiting area, basic services (phone, newspaper box, etc.), passenger pick-up and drop-off area, taxi waiting area, handicapped spaces, etc.
- designate preferential spaces for carpools (desirable)
- locate bus bays within or immediately adjacent to parking area

EXAMPLES: Park and Ride Lot 2.1

Baseline Station, Ottawa, Ontario

- Reg. Mun. of Ottawa-Carleton operates 3 park and ride lots in association with key Transitway stations
- Baseline (270 spaces); Orleans (525), Greenboro (300)
- cost $1700-2000/space
- Transitway system initially developed with no park and ride provisions, in order to focus demand on door-to-door bus service
- park and ride lots provided in response to market demand (e.g. to intercept extra-regional auto commuters prior to entering transit service area) and to focus travel demand on key transit corridors
- free parking at Orleans, Greenboro t.b.a.
- Baseline lot cost $9.50/month with bus pass (+$6.50 for residents not served by transit); free parking after 0930

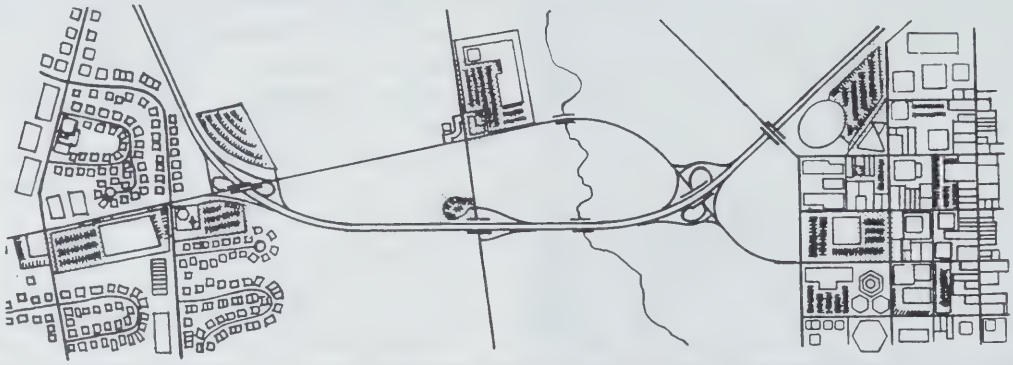
Seattle, Washington

- Municipality of Metropolitan Seattle operates 39 park and ride lots on leased property
- >1300 spaces in three major corridors
- leased on an annual basis with an option to renew for two years from churches, meeting halls, and commercial enterprises
- most lots are 30 spaces ± leased @ $2/space /month
- free parking to users
- supplements extensive publicly-owned park and ride lot system (47 lots, 14,000± spaces)

Pinemount Park & Ride Lot, US 290, Houston, Texas

- 903 space free parking lot
- sheltered transit terminal
- direct ramp to / from freeway median HOV lane
- no access to freeway for non-HOVs
- 16 km from CBD
- express bus route from P&R lot to CBD via HOV lane

HOV INCENTIVE: Carpool Parking Lot 2.2



ACTION

- identify candidate locations
- implement initial stage of lot
- expand / evolve in accordance with demand

APPLICATIONS

- dedicated lot, or
- shared-use lot in public / private areas where space un/underutilized in weekday peak periods: stadium, church, shopping centre, community / recreation centre, theatre, cinema, marketplace, etc.
- in conjunction with HOV lane
- in conjunction with park and ride lot, bus service
- in "leftover" property at freeway interchange
- to formalize unsafe / undesirable "casual" parking on roadsides or vacant lots near major highways

BENEFITS AND COSTS

Market Reach: ✓✓

Time Saved: - ✓

Cost Saved: ✓✓✓

Convenience: ✓ - ✓✓

Capital Cost: ✓✓

Ongoing Cost: ✓✓✓

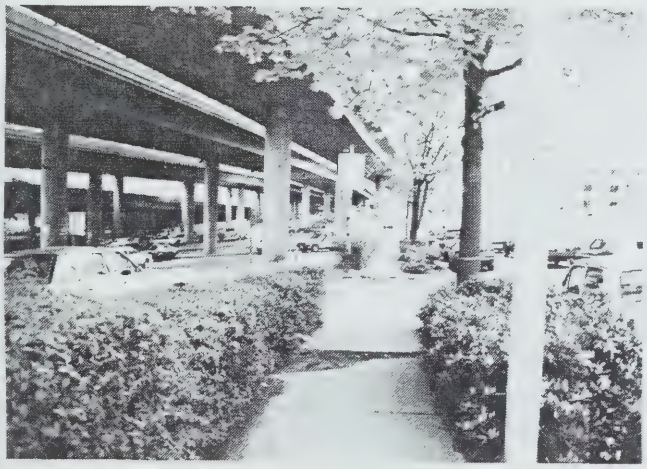
DESIGN GUIDELINES

- small-moderate size (20-200 spaces)
- locate on bus route (urbanized area) or as precursor to future bus route
- public telephone on site or nearby
- illumination highly desirable
- design entry to preclude use by large trucks (use 2.5 m height bar if necessary)

EXAMPLES: Carpool Parking Lot 2.2

Winston Churchill Boulevard at QEW, Mississauga, Ontario

- Ministry of Transportation of Ontario carpool lots
- first 6 lots opened summer 1979; 55 now in use, totalling 3,800 spaces (1992 data)
- located at freeway interchanges
- 41 lots in Central Ontario, 8 in Kingston area (Hwy 401), 2 in Ottawa, 3 in Northern Ontario (Hwy 17)
- signage on freeway; free parking
- typical amenities: telephone, newspaper box, lighting, good access, snow plowing, barriers to large trucks
- size 15 - 250 spaces:
  - (29) 15-50 spaces; (11) 51-99 spaces; (15) > 100 spaces
- average overall occupancy rate 54%; 8 lots > 90%
- annual savings in the order of 6 M ℓ fuel, 50 M veh/km of travel
- lack of transit service, lack of enforcement (use of lots by large trucks or stored vehicles) are key concerns
- 10 additional unofficial (unsigned) parking areas



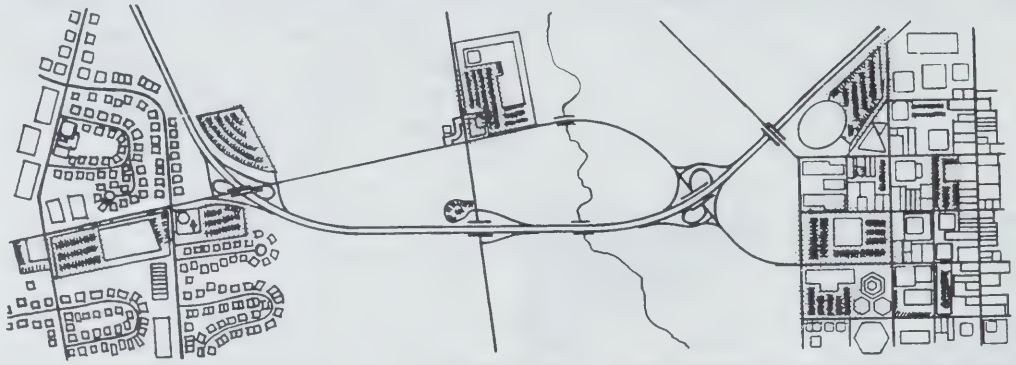
Carpool Parking Under I-5, Seattle

- large parking area under elevated freeway adjacent to downtown reserved for carpool use
- HOV lanes in freeway corridor serve lots
- supplemented by on-street carpool spaces
- transferable carpool permit issued, renewable quarterly
- 3+ carpools, $25/month fee
- enforced by parking authority

Church Lot Carpool Parking, Houston

- example of shared-use carpool parking
- commuters park M-F; church users park for evening / weekend activities

HOV INCENTIVE: Preferential Parking Spaces 2.3



ACTION

- reserve parking spaces in premium locations for HOVs
- reserve parking lots in premium locations for HOVs
- reserve on-street metered spaces for registered HOVs

APPLICATIONS

- Municipal Parking Lots
- Commercial Parking Lots
- Special Events
- Employer Parking Lots
- Park and Ride Lots
- Metered Parking
- any congested lot
- where parking constraints affect desirable travel patterns

BENEFITS AND COSTS

Market Reach: ✓✓

Time Saved: ✓

Cost Saved: ✓

Convenience: ✓✓✓

Capital Cost: ✓✓✓

Ongoing Cost: ✓✓✓

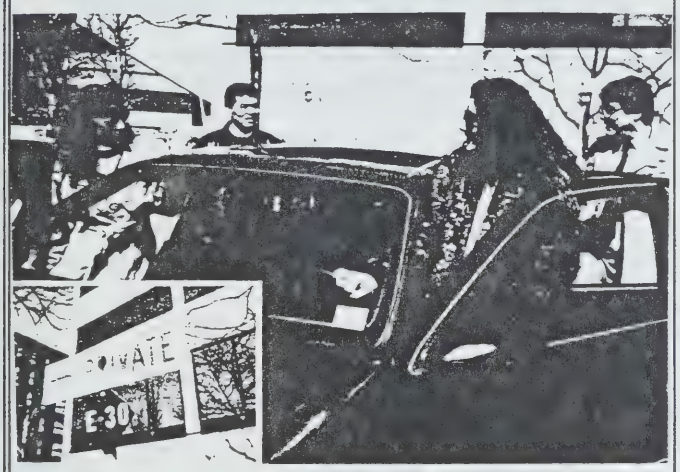
DESIGN GUIDELINES

- initiate as a pilot project and expand as needed
- carpool spaces to be clearly signed, lit, visible, and close to attraction
- initial project(s) in staffed lots to ensure enforcement
- apply to commuter-oriented (long term) lots by ending preferential designation at 10 1.m.±
- 3+ limits numbers and net benefits; 2+ expands market but enforcement more costly
- use registration tags and spot checks for enforcement in automatic / free lots
- "peer enforcement" via telephone hotline and posted information is possible
- pilot project size approximately 5% of total spaces

EXAMPLES: Preferential Parking Spaces

Port Credit GO Station, Mississauga, Ontario (GO Transit)

- pilot project at four suburban commuter rail stations
- registered 3+ carpools park nearest platform entry
- enforced by GO Transit (tag on mirror)
- spaces open to all cars after 10 a.m.
- permit renewed semi-annually
- conclusions - effective in creating mode shift, and overcrowding of early trains relieved (carpoolers did not have to arrive early to get available parking spaces; 60% shifted to a later, more convenient train)
- preliminary results (15 month survey):
  - space utilization >80%
  - 620 registered carpools, 250 preferential spaces
  - 36% previously drove alone, 50% carpooled, 7% took transit
  - 84% 2 occ.; 15% 3 occ.
  - 70% 5 days / week
  - 69% same household, 17% neighbours, 6% co-workers
  - 60% shifted to later train due to guaranteed parking availability
  - 25% interested in ridematching services



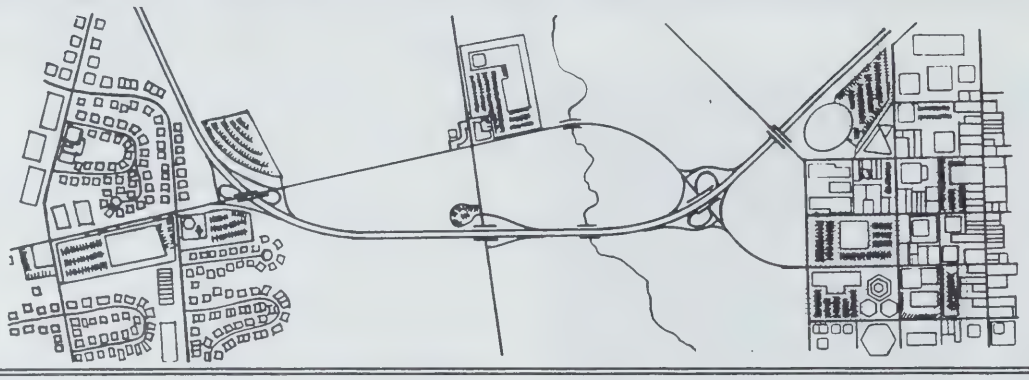
MTO Head Office, Downsview, Ontario

- 42 parking spaces reserved for registered carpools in prime locations within 2000+ space parking lot
- 3+ carpools eligible
- permit form reconfirmed every 3 - 4 months
- enforcement using spot checks and licence plate list; enforcement activity has not been maintained
- in-house ridematch service available
- no significant publicity

On-Street Carpool Parking, Seattle, Washington

- metered spaces "sold" to registered 3+ carpools @ $25/mo.
- carpool-only use 7-10 a.m. gives carpoolers "head start" on others
- non-HOVs can use space after 10 a.m.
- applies to work trip end in downtown
- 640 spaces in program
- carpool issued single transferable permit, assigned by zone
- quarterly renewal
- enforced by parking authority
- on-street and off-street lots in program

HOV INCENTIVE: Preferential Parking Rates 2.4



ACTION

- reduced rate / free parking for HOVs
- increased rate / paid parking for non-HOV cars

APPLICATIONS

- Municipal Parking Lots
- Commercial Parking Lots
- Special Events
- Employer Parking Lots
- Transit (Park and Ride) Lots

BENEFITS AND COSTS

Market Reach: ✓✓

Time Saved: ✓

Cost Saved: ✓✓✓

Convenience: ✓✓

Capital Cost: ✓✓✓ - ✓

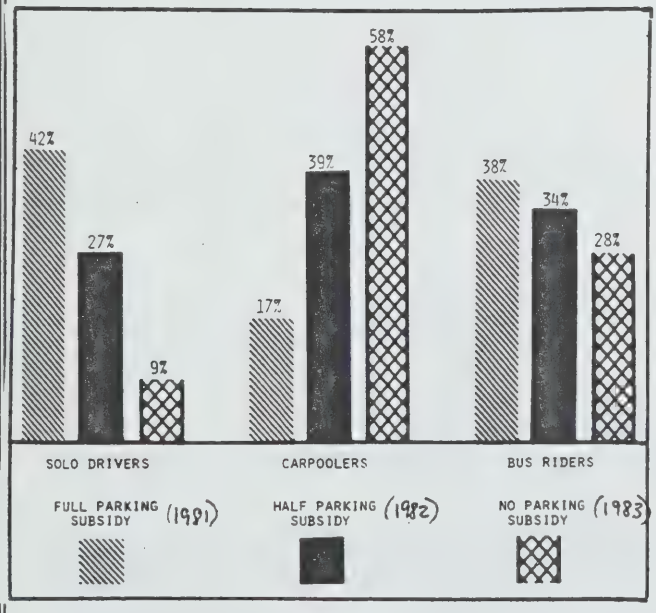
Ongoing Cost: ✓

DESIGN GUIDELINES

- dedicate entire lots to free / reduced parking; reduced enforcement needs
- can give discounted rates to carpools in commercial lots
- use carpool registration system and spot-check enforcement, rather than visual inspection on entry / exit; allows for dropping off carpoolers prior to reaching lot entrance
- lot must be clearly marked and rules explained on entry signage
- develop "preferential parking" symbol for incorporation with standard Ⓟ signage
- consider expanding registration system to ridematch program
- locate lots within walking / shuttle bus distance of employment destination
- covert a few spaces as "pilot project"; expand availability in response to demand
- balance potential of new HOV use against loss of parking revenue, cost of lot provision, enforcement / registration needs, and effect on transit use.

Minneapolis, Minnesota

- downtown Minneapolis
- implemented 1983, in association with I-394 HOV lane project feeding the downtown
- operated by Minnesota Rideshare, an agency within State DOT
- new parking garages were constructed over the freeway, with direct ramp connections; HOVs pay $10/month and non-HOVs pay $80/month
- garages connected to central area via elevated walkways
- 6 surface lots in downtown; state-owned lots are for free carpool parking, one private lot has $10 discount for carpools on $47 monthly fee
- lots located within downtown 10¢ bus zone
- eligible users are 2+, commute $\geq$ 3 days / week, work within 5 km of downtown
- pools re-register semi-annually
- 1983: 40 users, 189 spaces, 2 lots
- 1988: 1027 users, 1378 spaces, 5 lots
- average monthly savings $55 - 60 per person
- >90% cited free parking as an incentive to carpool



Employee modal choice and parking subsidy policy.

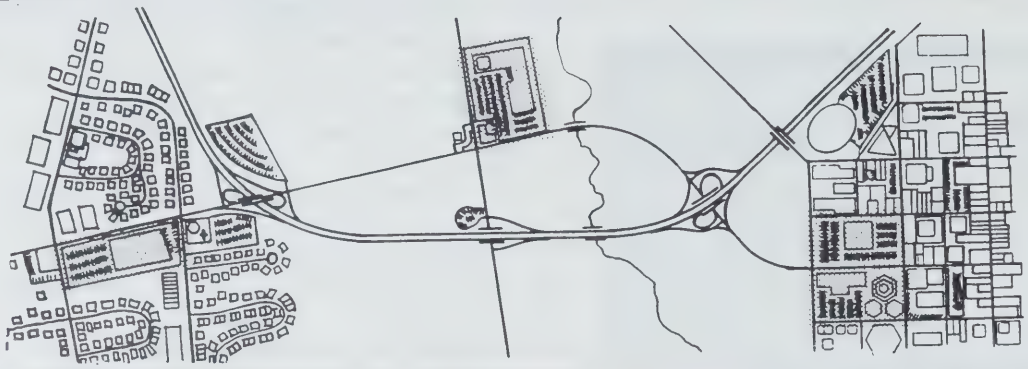
Commuter Transportation Services, Los Angeles

- 100 person office in Los Angeles, near CBD on transit (bus) corridor (5 routes)
- 30% of staff need car during the day for work use
- free parking phased out in stages between 1974 and 1983:
  - 1974 - free parking (company paid $57.50/mo/space) on site or off-site parking subsidized up to $57.50/month
  - 1976 - vanpools subsidized $57.50/month
  - 1979 - bus riders offered free passes ($34/month)
  - 1982 - solo drivers charged $28.75/month on-site and off-site subsidy reduced to $28.75/month max.
  - 1983 - solo drivers charged $57.50/month and off-site subsidy eliminated
- carpoolers, vanpoolers, and those who need a car for work continued to park for free

	No. of Solo Cars	No. of Carpools	Total Cars
1981:	28	6	34
1982:	18	13	31
1983:	5	19	24

- Carpools / bus subsidies cost $3000 / month (1983)
- 2 person carpools formed from solo drivers and some bus riders in order to continue benefit from subsidy. 4 of 5 remaining solo drivers shifted to cheaper off-site lot where they paid $20 / month

HOV INCENTIVE: Parking Bonuses 2.5



ACTION

- address parking needs through municipal planning / zoning process
- develop parking strategy which favours transit through discussions with developers, residents, business community, transit provider, etc.
- minimize need for parking bonuses through site planning control and Official Plan guidelines

APPLICATIONS

- development in corridor well-served by transit
- shopping centres, commercial / employment centres
- redevelopment / revitalization / intensification within urbanized zone
- transit terminal / station introduction

BENEFITS AND COSTS

Market Reach: ✓✓✓

Time Saved: N/A

Cost Saved: N/A

Convenience: N/A

Capital Cost: ✓✓✓

Ongoing Cost: ✓✓✓

DESIGN GUIDELINES

- provide parking bonuses as one part of a multi-modal site-specific effort
- ensure that on-street parking, etc. in surrounding area can be controlled if demand exceeds capacity on site
- combine with Demand Management strategy and support of non-auto modes
- focus on transit use in order to minimize auto presence; carpool use still implies need for parking, although reduced in scale
- closely integrate transit facilities and development (direct linkage or air rights preferable)
- measure does not apply unless development is within walking distance (400 m max., 250 m desirable) of "rapid transit" or equivalent

St. Laurent Shopping Centre, Ottawa, Ontario

- provision of Transitway station and local bus terminal at Regional Shopping Centre
- developer provided free property and expanded mall to link directly with station at mezzanine level
- municipality located station on site (higher cost than off-site alternative), reduced developer's overall parking requirements due to consequent high modal split to transit
- shopping centre could then expand floor area and build office tower, for greater density than would have been possible under "normal" parking space requirements
- greater density supports increased transit use and generates higher property tax revenue

Municipality	24h Transit Modal Share of all Trips (1986)	Parking Spaces / Unit	
		2 bdrm condo	2 bdrm apt.
Toronto	33%	1.00	0.75
York	32	1.25	1.00
North York	23	1.25	1.25
Scarborough	20	1.20	1.10
Etobicoke	19	1.40	1.20
Markham	13	1.62	1.62
Mississauga	12	1.25*	1.25*
Brampton	10	1.36	1.36
Oakville	10	2.00	1.62

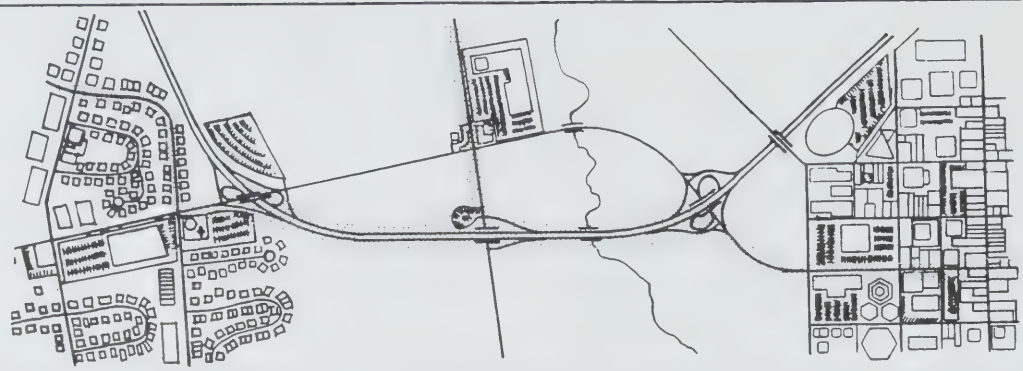
* revised from 1.75, 1992

Toronto Area Municipal Parking Standards

- modal split to transit (HOV) and municipal parking requirements for residential development are inversely related
- high density of transit service (e.g. Toronto) allows reduction in parking requirements, especially if apartments / condominiums are directed through land use planning to locate within proximity of rapid transit service; greater density in turn generates high modal split to transit
- reduced parking availability limits feasibility of owning a second car, therefore encouraging HOV use
- in York, per unit rate for Senior Citizen apartment reduced from .15 - .25 to .10 for building within 500 m of subway station
- current issue in Metro Toronto is "Main Streets" intensification, which would encourage 5 storey ± redevelopment in main transit streets without a required increase in parking provisions; parking issue has not been resolved

OPERATIONS AND SERVICES

HOV INCENTIVE: Express Bus Service 3.1



ACTION

- analyze origin-destination pattern of existing / potential riders
- lay out route to collect "full bus" then run non-stop to common destination(s) / node
- implement pilot project
- publicize, operate, evaluate, modify, and improve service

APPLICATIONS

- reflecting peak period origin-destination of commuters
- as areawide commuter service (e.g. GO Transit)
- in heavily-used corridor, as alternate to frequent-stop local service (e.g. every second bus operates express)
- between transit terminal and major employment centre
- utilizing priority lanes
- as element in hierarchical area transit strategy (local feeder, local corridor, and spine express routes)
- between widely separated nodes (trip time >30 min) in urban area or on routes where bus travel /time >2 x auto trip time

BENEFITS AND COSTS

Market Reach: - ✓✓

Time Saved: ✓✓ - ✓✓✓

Cost Saved: ✓

Convenience: ✓✓

Capital Cost: ✓

Ongoing Cost: ✓

DESIGN GUIDELINES

- utilize routing / scheduling / priority lanes to get 2 or 3 trips per bus in peak period
- use comfortable highway-type coaches where possible
- seated passengers only
- premium fare structure
- focus walk-in / feeder bus passengers at origin; shelter / waiting area desirable
- frequency 20-30 min. in peak periods, 1-2 h in midday and "trailer" bus in evening
- off-peak service (non-express) must be available
- destination at major employment focus and / or multi-modal transportation hub

EXAMPLES: Express Bus Service 3.1

OC Transpo (Ottawa)

- approx. 40 express routes operate during weekday peak periods only
- 6-9 a.m., 3-6 p.m.
- premium express fare: 100% premium on basic fare; 30% premium on peak period non-express route
- all routes serve east or west suburbs via bus-only Transitway; extends express "reach" of Transitway
- express buses gather passengers in "bedroom" suburbs, then use priority lanes / Transitway to run non-stop to downtown
- interlining allows express buses to "deadhead" back to origin to pick up a second / third peak trip
- most riders use monthly passes
- major contributor to 70% downtown modal split to transit

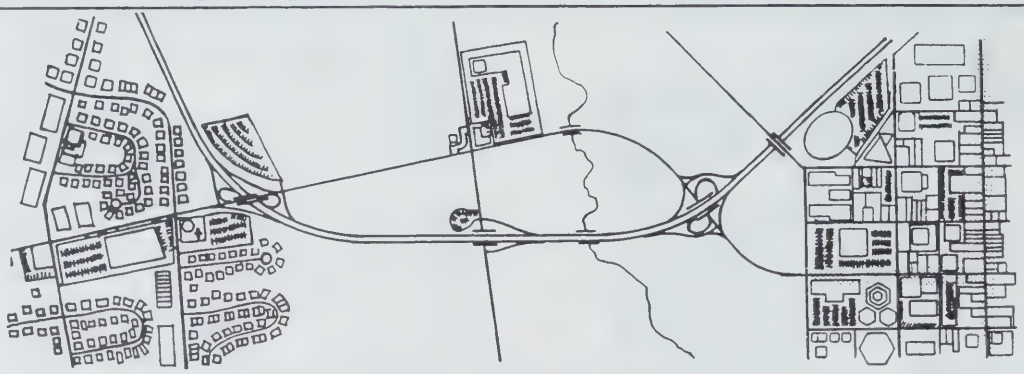
GO Transit, Toronto Area, Ontario

- 203-bus fleet provides interregional express bus service in seven commuter corridors focused on central Toronto
- provincial agency is sole carrier for interregional trips within Toronto commutershed
- complements / supplements successful commuter rail service, also in seven corridors
- buses carry 10 M passengers/year, trains 25 M
- distance-based fare, priced higher than local transit services to ensure market stability
- trip types: train feeder routes; train supplement routes (serving train stations in mid-day / evening periods); bus-only routes (linking centres not joined by train lines)
- utilize signed on-street stops and train station bus platforms
- most trips express via freeway if routing permits

Mississauga Transit

- 5 peak period express bus routes (of 58) plus 3 routes which use freeway to feed subway terminals
- introduced 1990, subsequent addition / refinement
- two types: (1) limited-stop direct service between two major nodes via congested corridor (e.g. Dundas #86), and (2) feeder routes for City Centre-oriented commuters (e.g. Streetsville #89)
- type (1) immediately successful, affected by slow growth in City
- type (2) limited success, affected by slow growth in City Centre, ample free parking, good auto access to Centre, and no transit priority measures
- HOV measures planned for type (2) routes

HOV INCENTIVE: Signal Operations 3.2



ACTION

- inventory potential locations
- identify alternative treatments and determine preferred strategy
- implement pilot project
- monitor operations, modify and expand as necessary

APPLICATIONS

- options include signal pre-emption, signal progression, and preferential signal rates for HOVs
- on arterial roads with significant bus use
- on arterial HOV lanes and bus lanes
- bus streets
- on streets with closely spaced signals (<500 m$\pm$)
- metered freeway entrance ramps

BENEFITS AND COSTS

Market Reach: ✓

Time Saved: ✓- ✓✓

Cost Saved: ✓

Convenience: ✓✓✓

Capital Cost: ✓✓

Ongoing Cost: ✓✓

DESIGN GUIDELINES

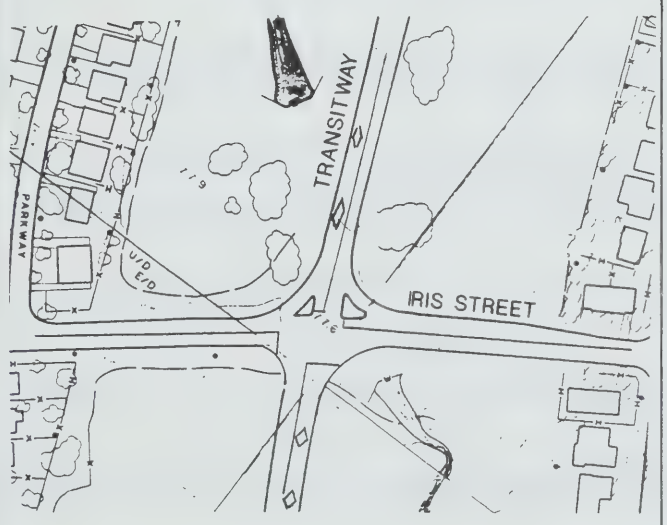
- bus volume on arterial road >10/h
- design signal progression around principle of maximum person throughout / minimum delay to persons, rather than maximum vehicle throughout
- signal pre-emption is most effective with an on-board emitter on buses; for HOV use, utilize in-pavement vehicle detector loops in HOV lane to affect length of green time
- benefits: energy savings, time savings for net improvement in person movement, accident rate reduction
- costs: receiver and signal controller, emitter and / or pavement loops, staff / consultant time for analysis and design, operating / monitoring expenses

Ramp Meter Bypass Lane, Minneapolis, Minnesota

- metered freeway entrance ramp with HOV bypass lane
- bypass lane may operate freely in initial phase (several years)
- for safety purposes, to limit congestion, to enable enforcement, or to affect HOV mix, metering can be extended to HOV lane
- where multiple HOV lanes are present (e.g. toll plaza) HOV 3+ could have different metering rates than 2+
- HOV-only ramps may be metered, with HOV 3+ given priority (bypass lane) over HOV 2

Albert Street / Slater Street, Ottawa, Ontario

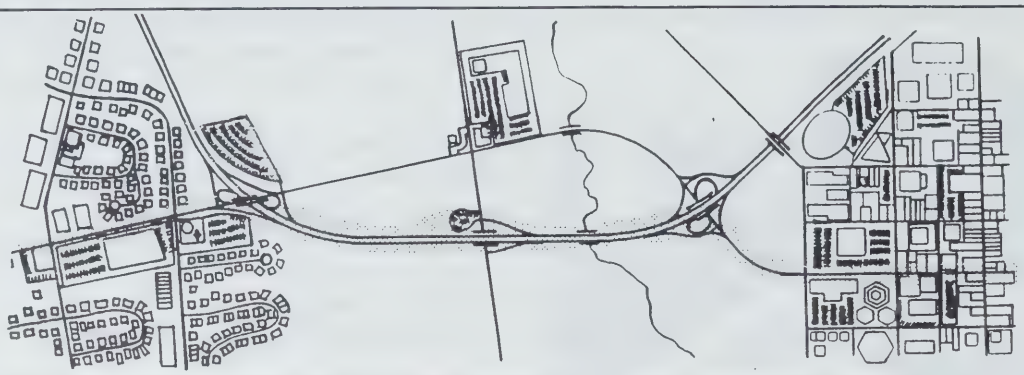
- one-way pair of downtown streets have dedicated bus lanes operating as key part of Transitway system
- part of signalized grid of intersections in downtown
- initial operation (1970s) featured special signal phases for buses; since signal timing restricted by role in grid system, phasing later reverted to "normal"
- current phasing optimized for buses rather than cars
- anticipated future growth in demand from current 180 - 200 buses/h/dir may lead to reconsideration of signal prioritization for buses



Southwest Transitway, Ottawa, Ontario

- signal pre-emption by buses
- one of three signalized intersections on Ottawa Transitway system (grade separation impractical due to road and creek profiles)
- in-pavement vehicle detector loops (located on the Transitway 45 m and 80 m in advance of the intersection) are connected to the signal controller; transitway buses are given green light with no stopping required (allowing for minimum green interval for crossing traffic / pedestrians)
- peak hour travel:
  - Transitway: 50 - 60 buses/h/direction
  - Iris Street: 184 veh/h/dir (AM peak)
    472 veh/h/dir (PM peak)

HOV INCENTIVE: Enforcement 3.3



ACTION

- involve enforcement agency in initial planning stage of any HOV project
- follow through to operation
- ensure legal / legislative requirements (time structures, by-laws, penalties) in place
- identify funding requirements and sources
- marketing / public education to ensure general awareness of rules and consequences
- monitor effectiveness of actions and adjust enforcement actions accordingly

APPLICATIONS

- essential element of most HOV incentive measures
- direct action (pull over and cite violator)
- indirect action (observe violator and ticket owner by mail)
- preventive action (gate-controlled access to HOV parking or roads)
- raise fines / expand penalty structure (demerit points)
- restrict eligibility to easily-enforced vehicles (buses, vans)
- marketing / public education / peer pressure
- design features to allow / encourage enforcement

BENEFITS AND COSTS

Market Reach:	✓✓✓
Time Saved:	N/A
Cost Saved:	N/A
Convenience:	N/A
Capital Cost:	✓
Ongoing Cost:	✓

DESIGN GUIDELINES

- effectiveness of enforcement depends much more on the risk of being caught than on the penalty involved
- most HOV facilities are used by commuters in a consistent daily pattern; a 2.5% apprehension rate will therefore pose a high risk that daily violator will be stopped within a month
- a 10% violation rate has been observed to be the upper limit of "publicly acceptable" usage for freeway HOV lanes
- introduction of some form of control measure (e.g. pre-authorization, restricted entry, or barrier separation) is highly effective; cost must be weighed against benefits
- new legislation required to allow "ticket by mail"
- if direct action used, adequate pull-over areas (shoulders, enforcement refuges, etc.) must be provided adjacent to the HOV lane
- signage and pavement markings must be clear and concise
- "HERO" type program proven effective elsewhere; GTA potentially suitable application due to world's highest per capita cellular phone usage rate

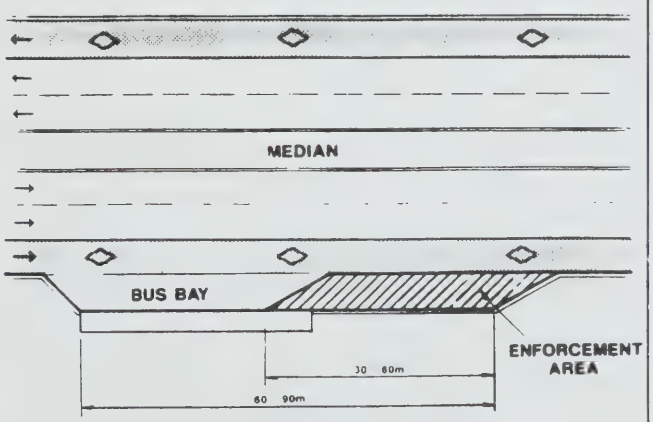
Route 55, Orange County, California

Fines for Occupancy Violations

- Metro Toronto / Mississauga (Dundas Street West HOVL): $50 + tax
- California (various freeway HOVL):
  $100 min/$150 max first offence
  $150 min/$200 max second offence in 1 year
  $250 min/$500 max third offence in 2 years
- Ottawa (Transitway): $50 + tax
- Hartford (I-84): $40
- Los Angeles (ramp bypass): $160
- Houston (HOV lanes): $75

"HERO" Program, Seattle

- motorists telephone 764-HERO to report vehicles violating the occupancy rules on area HOV lanes
- frequent signage on freeway HOV lanes
- require license number, date, time, location, number of occupants, and vehicle description
- first report: vehicle owner receives brochure about proper use of HOV lane
- second report: vehicle owner receives letter
- third report: vehicle owner notified that license number has been registered with police enforcing HOV lanes
- in 1987, 5% of first-time violators were reported twice; 1% three or more times
- average 50 calls / day; annual cost $16,000 U.S.
- strong public support for program
- contributed to 33% reduction in violation rate

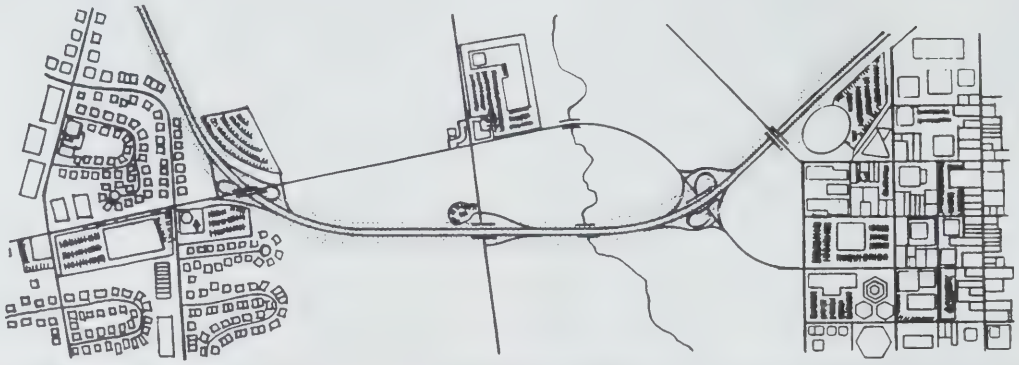


Metro Toronto HOV Network Study

- physical provisions for enforcement include:
  - extended bus bays on suburban arterials (shown)
  - side street zones
  - paved shoulders on rural cross-section roads (no curbs)
  - pull-over shoulder downstream of HOV lane entry point
- enforcement-related signage clearly visible by pulled over vehicle
- adequate room for safe movement
- vehicles not stopped within traffic flow

ON-LINE PHYSICAL FACILITIES

HOV INCENTIVE: Freeway HOV Lane 4.1



ACTION

- add new lane
- restripe to add new lane within existing pavement
- convert mixed flow lane to HOV use

APPLICATIONS

- congested freeways where HOVs can gain 5-10 minute minimum time advantage over non-HOVs
- where adequate usage (initial and long term) exists for lane to be seen to be well-used
- when a freeway is being widened to its final / ultimate cross-section
- during construction-induced congestion
- where HOV alternative is more beneficial (cost-effective) than mixed flow alternative over design lifetime
- where physically / economically feasible

BENEFITS AND COSTS

Market Reach:	✓✓
Time Saved:	✓✓✓
Cost Saved:	✓
Convenience:	✓✓✓
Capital Cost:	✓
Ongoing Cost:	✓

DESIGN GUIDELINES

- see MTO "Operational Design Guidelines for HOV Lanes on Ontario Freeways"
- median designs - HOV 2+ designation, in order to achieve adequate usage
- 24 hour operation preferred; peak period operation is possible
- geometric design standards similar to mixed flow lane
- separate HOV lane from adjacent lane by paint marking (if part time operation), 1.25 m wide painted buffer zone (if retrofit), or barrier (if new freeway or adequate right-of-way available)
- continuous or occasional 4 m wide shoulder enforcement
- access / egress options are site-specific: continuous, designated areas, or direct ramps at major activity centres
- right side operation only if needed by bus operations

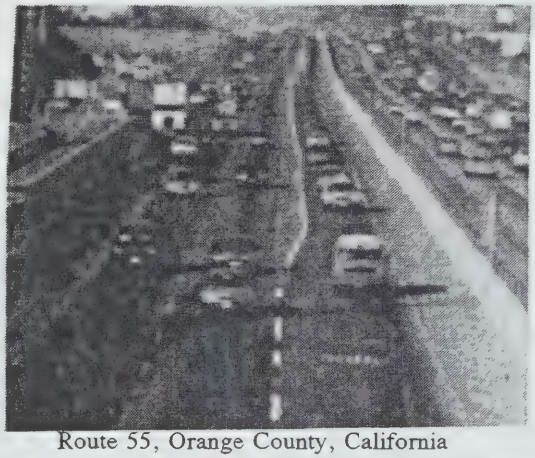
EXAMPLES: Freeway HOV Lane

I-15, San Diego, California

Characteristics:
Reversible, barrier-separated, 2 lanes, median 2+ occupancy, 3 hour a.m. and p.m. peak period operation, 13 km long, implemented 1988

Peak Hour Usage (1990):
14 buses, 1,259 cars / vans, 3036 persons, violation 3%.

Notes:
Reconstructed median of CBD-oriented freeway to serve inbound a.m. peak and outbound p.m. peak demand. Double reversible flyovers at terminus. Cost $6.5 M/km ($US, 1988)

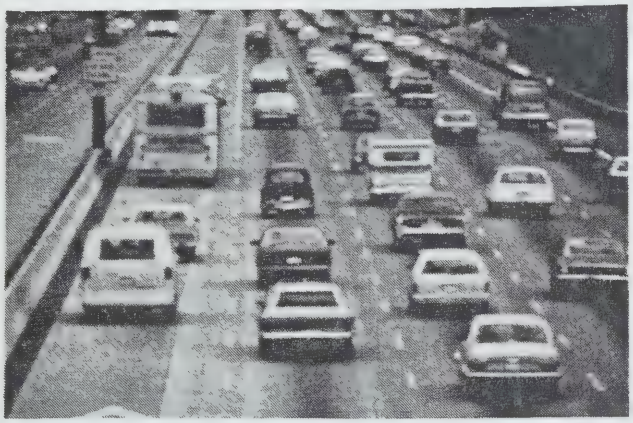


Route 55, Orange County, California

Characteristics
Concurrent flow, buffer-separated, 1 lane each direction, median, 2+ occupancy, 24 hour operation, 18 km long, implemented 1970.

Peak Hour Usage (1990):
3 buses, 1,295 cars / cans, 2,737 persons, violation 6%.

Notes:
Typical 1.25 m buffer zone provides effective delineation; designated entry / exit segments provide weave opportunity. Element in areawide network (freeway-to-freeway HOV ramps used).

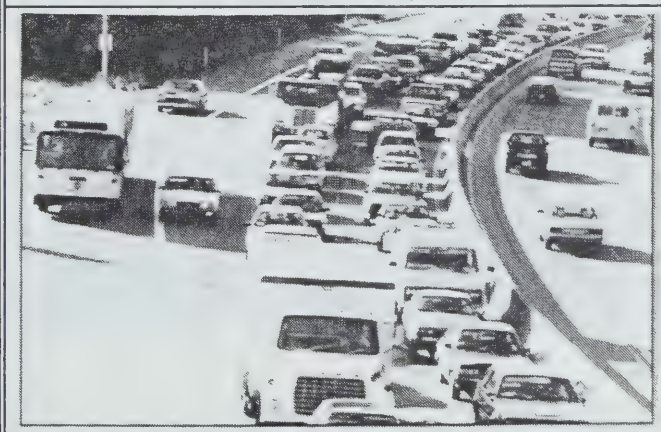


I-5, Seattle, Washington

Characteristics:
Concurrent flow, non-separated, 1 lane each direction, median, 3+ occupancy, 24 hour operation, 10 km long, implemented 1983.

Peak Hour Usage (1990):
64 buses, 466 cars / vans, 3,710 persons, violation 11% ±.

Notes:
Retrofit of existing freeway to protect for expandable peak period capacity within existing cross-section and r.o.w.



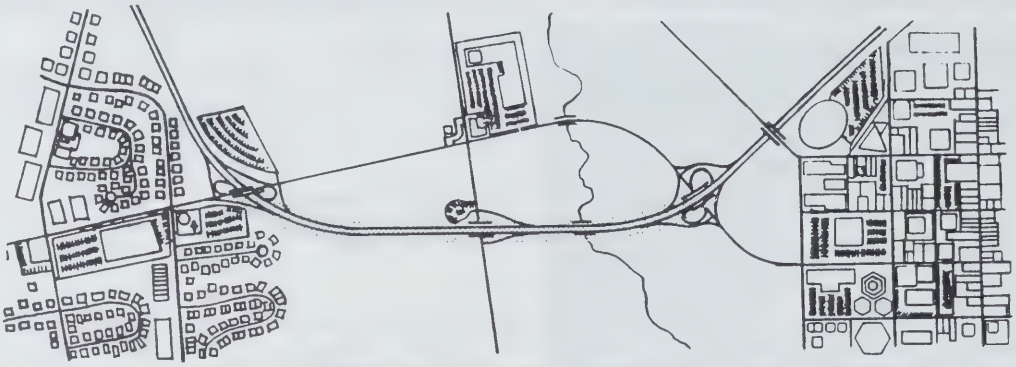
I-405, Seattle, Washington

Characteristics:
Concurrent flow, non-separated, 1 lane each direction, outside lane use, 2+ occupancy, 24 hour operation, 10 km long, implemented 1986.

Peak Hour Usage (1990):
2 buses, 386 cars / vans, 910 persons, violation 8%.

Notes:
Unusual right lane application has weave segments at interchanges and on-line bus pullovers for passenger pick up. Smooth operation due to low HOV and ramp entry volumes. Cost $3 M/km ($US, 1988).

HOV INCENTIVE: Freeway Bus Lane 4.2



ACTION

- strengthen / widen right shoulder to allow peak period bus use
- convert underutilized non-peak direction lane to contraflow bus lane in peak period

APPLICATIONS

- past recurring congestion "bottleneck"
- minimum bus volume approximately 30/h (varies for local conditions)
- where off-peak direction maintains Level of Service 'C' over design life (contraflow application)
- where concurrent flow alternatives are not feasible (contraflow)
- as initial low-cost, readily implemented stage towards HOV lane / Transitway in corridor
- as temporary measure during construction period

BENEFITS AND COSTS

Market Reach: ✓✓

Time Saved: ✓✓✓

Cost Saved: ✓

Convenience: ✓✓

Capital Cost: ✓

Ongoing Cost: ✓✓

DESIGN GUIDELINES

- see MTO "Operational Design Guidelines for HOV Lanes on Ontario Freeways"
- right shoulder: full strength pavement, 3.5 m wide, 1.0 m added shoulder
- contraflow: delineation by cone placement or moveable barrier, 3.5 m min. lane width, 3 m min. breakdown shoulder
- operate during period of congestion only (typically 630-1000 and / or 1530-1900)

Highway 17, Ottawa, Ontario

Opened:	1991
Type:	reconstructed, widened shoulder used by buses
Operation:	0630-0900 WB only M-F; general purpose shoulder at other times
Length:	8.5 km
Eligibility:	OC Transpo buses
Time Savings:	
Peak Hour Usage:	107 buses 5600 passengers
Start:	Park and ride lot, transit terminal
Interchanges:	all buses exit freeway at two mid-point interchanges, pick up local passengers, and re-enter via transit interface
End:	direct bus-only right side slip ramp to Transitway

Champlain Bridge, Montreal, Quebec

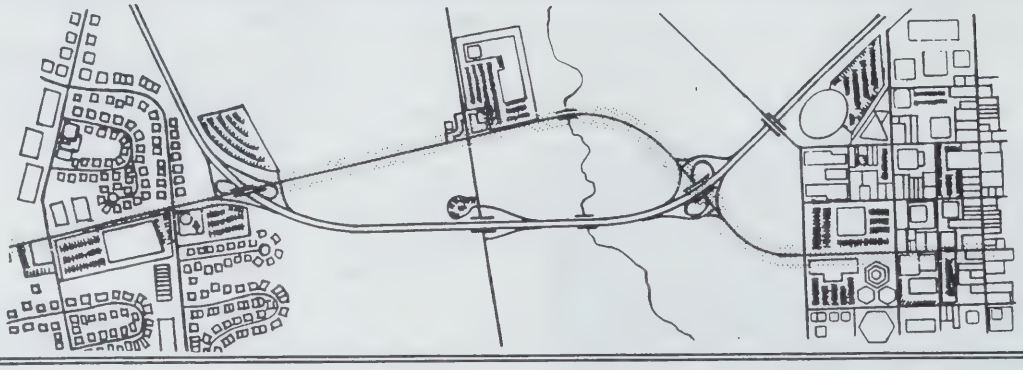
Opened:	June 19, 1978
Type:	contraflow bus lane
Operation:	0630-0930 NB, 1530-1900 SB, M-F
Length:	7.0 km
Eligibility:	STRSM and CIT buses
Peak Hour Usage:	90 buses± 4560-5300 passengers
Function:	augments capacity over long bridge across St. Lawrence River; no other opportunity to widen bridge
Accessories:	overhead lane Control Signs and Closed Circuit TV cameras (shown)

Route 495 (Approach to Lincoln Tunnel), New Jersey

Opened:	1970
Type:	contraflow bus lane
Operation:	0600-1000 EB only, M-F
Length:	4 km
Eligibility:	buses only
Peak Hour Usage:	725 buses± 34,700 passengers

(Note - "extreme" example, illustrating a bus lane equivalent to the capacity of most subway systems)

HOV INCENTIVE: Arterial HOV Lane 4.3



ACTION

- identify candidate corridors (HOV use, congestion, transit delay, available width)
- analyze traffic impact of new / converted lane, and associated HOV benefits
- develop plans in consultation with local merchants, residents, police, bus operators
- publicize and implement on a "pilot project" basis; monitor, modify and extend

APPLICATIONS

- moderate - heavy bus use (20-60+ buses/h)
- if corridor of lesser bus use (5-20/h), where adequate car / vanpools exist or can be generated to move more people than adjacent lane
- major congested arterial road
- arterial road widening
- approach to major employment centre / transit node
- as element in areawide HOV lane network
- where lane reverts to on-street parking in off-peak period

BENEFITS AND COSTS

Market Reach: ✓ - ✓✓

Time Saved: ✓✓

Cost Saved: ✓

Convenience: ✓✓

Capital Cost: ✓

Ongoing Cost: ✓

DESIGN GUIDELINES

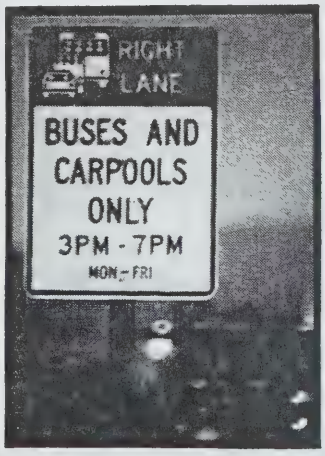
- refer to "Metro Toronto HOV Network Study" Final Report, Metropolitan Toronto Transportation Department
- HOV 3+ designation preferred; HOV 2+ risks congestion to buses
- right curb lanes
- distinguish lane by double dashed lines and frequent signage
- 4 lane or 6 lane arterials; 4 lane only if parallel options are available for mixed flow
- severe turning restrictions (right and left) required on 4 lane roads; 6 lane operation more flexible
- modal shift only likely to result if HOV lane is long enough to generate 5-10 minutes time savings (either standalone or with other incentives)
- bus bays highly desirable to allow carpools and express buses to bypass local buses at stops
- provide for enforcement (pullover bays, extended bus bays, signage, fine structure, police cooperation)
- priority measures in a.m. peak period are more important than p.m. peak in generating HOV use

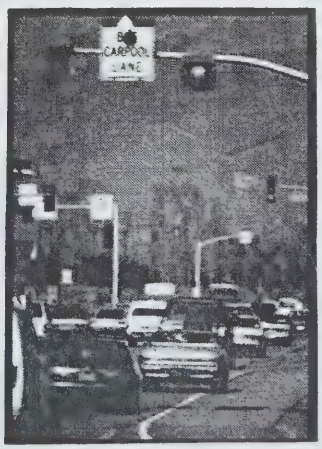
Dundas Street West, Mississauga / Etobicoke, Ontario

Opened:	January 6, 1992
Cost:	$1.6 M/lane km (new lane), $13,000/lane km (signage / markings for existing lane)
Type:	added lanes (part), converted from general purpose lanes (part)
Operation:	0700-1000, 1500-1900 M-F both directions
Length:	5 km
Eligibility:	bus, taxi, 3+ cars
AM Peak Usage:	250 veh, 2050 persons (2h)
Delineation:	double dashed lines, diamond pavement marking, overhead signage
Network:	first element of ultimate 300 km network of arterial HOV 3+ lanes
Notes:	development of effective enforcement strategy has been problematic in first year of operation

Boulevard Maisonneuve, Hull, Quebec

Opened:	May 15, 1991	
Cost:	$50,000±	
Type:	converted from general purpose lanes	
Operation:	0700-0900, 1530-1800 M-F both directions	
Length:	1.12 km, 7 blocks	
Eligibility:	bus, taxi, 3+ cars	
Time Savings:	3-4 minutes	
Peak Hour Usage:	AM SB	PM NB
Bus	39	52
Car	120	92
Person	2600	2100

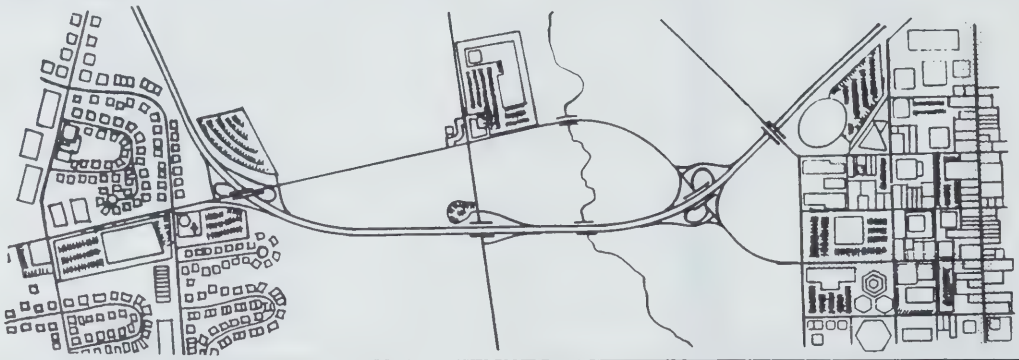




San Thomas Expressway, Santa Clara, California

Opened:	November, 1982
Cost:	$3.5 M (U.S.)
Type:	added lanes to 4 lane divided limited access signalized high-speed arterial
Operation:	0600-0900 NB, 1500-1900 SB M-F
Length:	10.5 km
Eligibility:	bus, 2+ cars
Time Savings:	6.8 min AM peak hour NB 4.5 min PM peak hour SB
Peak Hour Usage:	440-460 veh/h (1989 data); 47% growth from 1982
Implementation:	initial temporary use of shoulders and right turn lanes; replaced by new lanes
Delineation:	overhead signage only
Enforcement:	violation rate 6%±, 8 citations/day (avg 1988)
Bus Use:	2 routes; tripled ridership upon lane opening
Network:	first element of ultimate 225 km of "expressways" and freeway HOV 2+ lanes

HOV INCENTIVE: Arterial Bus Lane 4.4



ACTION

- identify candidate corridors (transit use, congestion, transit delay, available width)
- analyze traffic impact of new / converted lane, and associated transit benefits
- compare bus-only use versus HOV 2+ or HOV 3+ operation alternative
- develop plans in consultation with local merchants, residents, police, bus operators
- implement on a "pilot project" basis; monitor, modify, and extend

APPLICATIONS

- on multi-lane road (4 lanes minimum, 6 lanes preferred)
- where bus frequency >30/h (adjust for local conditions)
- where bus operation is delayed by road congestion
- where turn restrictions can be applied
- where alternative parallel routes exist (if existing general purpose lanes are to be converted to bus use)
- where on-street parking can be eliminated during peak period
- where residents, businesses, transit agency, and municipal government accept / support initiative
- as contraflow lane on a one-way street

BENEFITS AND COSTS

Market Reach: - ✓✓

Time Saved: ✓✓

Cost Saved: ✓

Convenience: ✓✓

Capital Cost: ✓✓ - ✓✓✓

Ongoing Cost: ✓✓

DESIGN GUIDELINES

- peak period usage only (possibly peak direction only)
- no minimum length; can be one block link or 5 km long arterial route
- utilize existing general purpose lane if necessary; add lane if possible
- right curb concurrent flow median, or contraflow lane designs available, depending on transit needs, auto operation, and land use
- left or right curb contraflow lanes on one-way street system
- signage (overhead and pavement) and lane markings (double dash) are essential
- provide bus bays to allow express bus operation past stopped buses
- enforcement provisions (signage, pull-over bays, adequate fine structure, etc.) needed
- immediate towing of stopped / parked vehicles
- test against HOV 2+ / 3+ use; where operationally feasible, HOV use would generally be preferred over bus-only use in order to expand benefits at little cost

EXAMPLES: Arterial Bus Lane

Bay Street, Toronto, Ontario

Opened:	October, 1990
Type:	curb lane concurrent flow lanes converted from general purpose lanes on 4 lane CBD arterial
Operation:	0700-1900, 2-way, M-F
Length	2.9 km
Eligibility:	buses, taxis, bicycles
Usage:	
Time Savings:	AM peak - 0 mid day - 2 min PM peak - 3 min
Features:	no parking / stopping in lane (tow away zone); no turns allowed at 6 right turns, 17 left turns
Public Acceptance:	very good
Issues:	use by ineligible vehicles, enforcement, stopped vehicles, courier / delivery access
Traffic Impact:	no significant congestion increase due to numerous parallel alternatives; all Bay Street traffic less congested due to turn

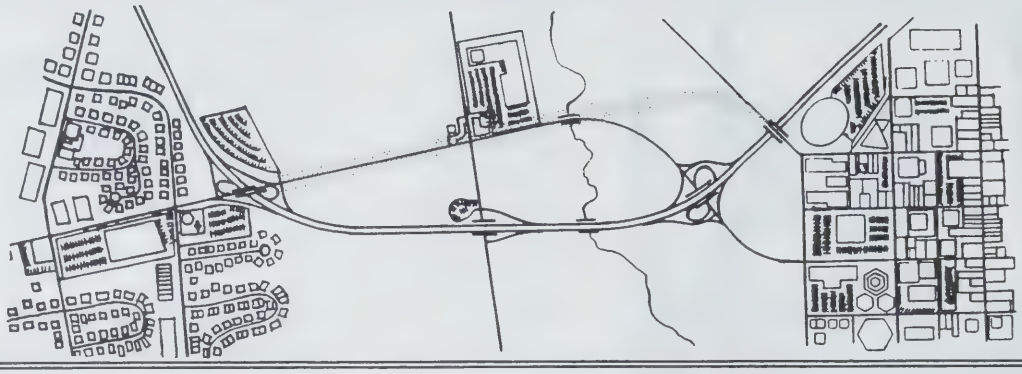
Allen Road / Dufferin Street, Toronto, Ontario

Opened:	1982
Type:	curb lane concurrent flow lanes on added lanes on 6 lane limited access suburban arterial
Operation:	0700-1000, 1530-1900 2-way, M-F
Length:	3.1 km
Eligibility:	buses, taxis 1982-1993; opened to HOV 3+ in 1993 as part of Metro Toronto HOV Network
Usage:	amph 2150 bus pass/h NB, 1400 SB pmph 1400 pass/h NB, 1400 SB
Time Savings:	0-10 min depending on congestion
Function:	GO Bus and York University routes linked with subway route terminus
Enforcement:	problematic due to non-mountable curb, although r.o.w. available for shoulder; all vehicles allowed to enter lane 50 m upstream of intersection for right turns

Boulevard Pie-IX, Montreal, Quebec

Opened:	June 18, 1990
Type:	median contraflow lanes on 6 lane road
Operation:	0630-0930 SB, 1500-1900 NB, M-F
Length:	6.8 km
Eligibility:	STCUM buses
Time Savings:	12 min. ±
Features:	median bus shelters daily cone placement left turn restrictions bus-mounted flashing arrows express bus use only; local service remains at right curb

HOV INCENTIVE: Bus-Only Roadway (Transitway) 4.5



ACTION

- identify candidate corridors and demand in areawide transportation study
- carry out standard planning and design process for a new roadway
- build key stations and initiate express bus service via roads or HOV lanes
- implement busway in stages, as funding and demand allow

APPLICATIONS

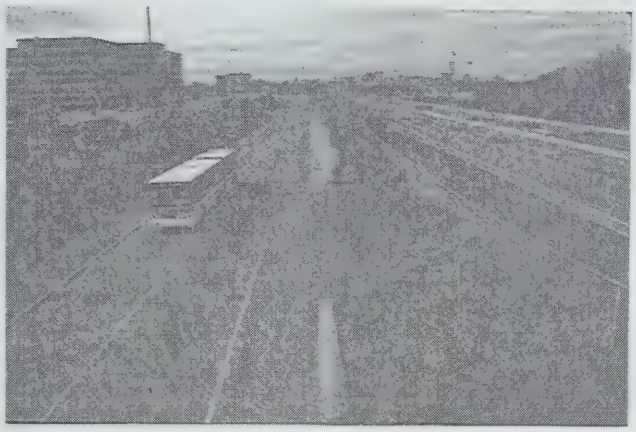
- in congested road / freeway corridor
- where right-of-way becomes available (e.g. abandoned rail line)
- where bus frequency is approximately 60/h and cannot be effectively accommodated on road system
- in "new town" planning
- to spur development of employment node
- where transit demand can be focused at key points and fed non-stop to destination
- as localized bottleneck bypass, or as areawide transit spine
- as lower-cost, flexible precursor to ultimate rail transit line

BENEFITS AND COSTS

Market Reach:	✓✓
Time Saved:	✓✓✓
Cost Saved:	✓
Convenience:	✓✓
Capital Cost:	✓
Ongoing Cost:	✓

DESIGN GUIDELINES

- see "Transitway Design Manual", Regional Municipality of Ottawa-Carleton
- design as separate roadway for 80 km/h bus-only operation; similar standards as general purpose road
- consider HOV (carpool) use of roadway as design option
- grade separate bus roadway with all crossing roads, if physically / fiscally possible; grade separate pedestrian movement at stations
- rationalize bus routes / services to focus on access to stations and express travel between nodes
- locate stations at crossing roads and major centres (potential joint / integrated development)
- provide bypass lanes at all stations to allow for express (through) bus operation



East Transitway, Ottawa, Ontario

- 26 kilometre long bus-only road network in four corridors
- 24 stations
- grade separated at all major crossings
- current peak usage 10,000 pass/h/dir; capacity up to 20,000/h/dir.
- network average cost $17.7 M/km incl. stations
- 2 lanes @ 4 m; 4 lanes @ stations
- station platforms 6 m x 55 m
- 1 main "trunk" route, 7 partial trunk routes, 40 timed transfer local feeder routes, 50 peak period express (no transfer) routes to / from downtown
- efficient operation allows 15% reduction in fleet size
- significant public development had occurred at and around stations

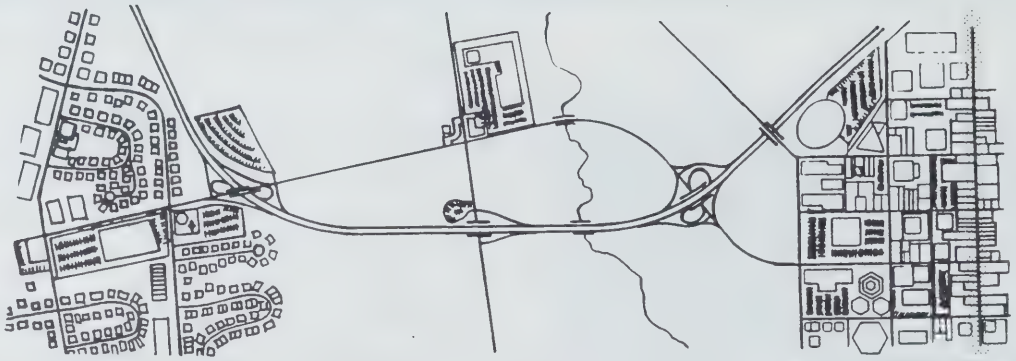
Runcorn, England

- "new town" developed since 1964 around a 21 km busway
- 2 lane, 2 way, 6.7 m wide bus-only roadway
- elevated in city centre; traffic signal pre-emption at intersections elsewhere
- bus service 5-15 min headways
- employer-coordinated support programs in operation

Northeast Busway, Adelaide, South Australia

- opened 1986-89
- 12 km long guided busway
- "O-bahn" design by Mercedes-Benz; lateral guidewheels installed at front of buses
- buses operate normally on city streets and at busway stations; 80-90 km/h "hands-off" operation on busway
- narrow right-of-way, less visual intrusion, operational flexibility, cited as advantages
- low-maintenance concrete track
- park and ride lots, feeder / express buses used
- significant effort in landscaping / urban design

HOV INCENTIVE: Bus-Only Street (Transit Mall) 4.6



ACTION

- identify candidate streets from congestion / transit use / delay studies
- assess alternatives and begin consensus / constituency building
- fully involve local merchants in process
- develop and approve recommended plan and implementation strategy
- implement, either as pilot project or as "ultimate" plan

APPLICATIONS

- in central business district
- where alternative parallel routes exist for current street users
- where high volumes (approx. >50/h/dir) of buses are present or can be routed
- storefront retail / commercial atmosphere, where removal of parking / traffic lanes can allow expanded sidewalks
- as part of a "pedestrian mall" concept
- in peak hours only or all day
- where on-street parking can be removed / replaced
- as element in central area car-limiting strategy

BENEFITS AND COSTS

Market Reach: -

Time Saved: ✓ - ✓✓

Cost Saved: ✓

Convenience: ✓✓

Capital Cost: ✓

Ongoing Cost: ✓

DESIGN GUIDELINES

- develop community consensus, including transit operator(s), area merchants and residents, elected officials, traffic planners, and urban designers
- design street, bus stops, etc. for permanence and for flexibility
- focus CBD bus routes on two-way (or parallel on-way) bus street(s)
- allow for delivery / access to merchants (off peak, side streets, back alleys, etc.)
- various design concepts available; suit local needs
- consider pedestrian-bus conflict potential carefully
- replace on-street parking with off-site areas (or eliminate if possible)
- implement transit signal priority along mall
- allow "leap-frog" bus operation to ensure service flexibility, reliability; busbays or "passing lane" required at key points

EXAMPLES: Bus-Only Street (Transit Mall) 4.6

Rideau Street, Ottawa

- major commercial street in CBD
- 0.4 km segment adjacent to new enclosed shopping centre converted to bus-only operation in 1983
- complete climate control for pedestrian areas, including enclosed sidewalks, overhead passages, and bus shelters
- original 6 lane street with curb parking and narrow sidewalks reconstructed as 1 bus lane/direction, plus alternating extra lane to allow passing at bus stops
- 24h bus/taxi use initially; later reduced to 0600-1900 Monday - Saturday
- mall and shelters to be removed in 1993 due to local merchants' desires (shelters attract vagrants, lack of streetfront exposure are key concern)
- probable reconstruction as fire lane arterial: 2 for cars, 2 curb bus lanes, 1 bus bay lane, no stopping/turning, no shelters
- peak period reserved bus lanes on 4 lane arterial extend 3 km to the east of mall segment
- current usage:

	buses	passengers
AM peak period	450	14975
midday	536	19065
PM peak period	426	14760

Bank Street, Ottawa

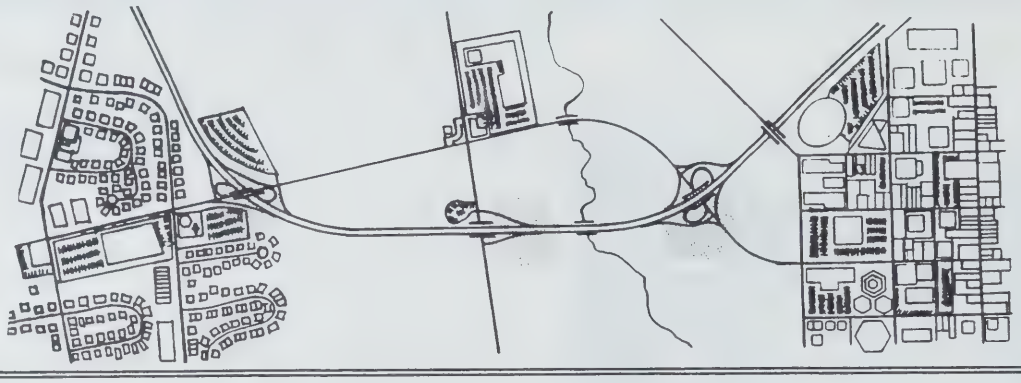
- major 4 lane commercial street in CBD
- 5 block (0.4 km) segment restricted to bus-only use for brief period in early 1980s
- in association with "streetscaping", conversion of 2 lanes to wide sidewalks / bus bays
- local merchants' pressure resulted in abandonment of transit mall concept
- transit service shifted half of Bank Street routes to parallel arterials to avoid subsequent congestion
- turn lanes currently being provided to improve traffic flow

Granville Street, Vancouver

- main shopping street in downtown Vancouver
- pedestrian / transit mall created in 1974; widened sidewalks and 1 lane / direction for buses (emergency vehicles, deliveries, taxis in consignment allowed); lanes "weave" as part of streetscaping
- no bus bays / pulloffs; buses operate single file
- 24h / day operation, 7 days / week
- 6 blocks long in 1974; reduced to 5 blocks in 1988 in an effort to revitalize street life and on-street shopping following opening of major underground shopping centre nearby
- usage: 9 routes (8 trolleys, 1 diesel)

am peak hour	70 buses/h NB, 65/h SB
midday	47 buses/h NB, 43/h SB
pm peak hour	76 buses/h NB, 69/h SB
all day	924 buses NB, 820 SB
all day	40-50,000 passengers avg.

HOV INCENTIVE: Queue Bypass Lane 4.7



ACTION

- provide HOVs with non-stop or expedited passage past brief recurring points of congestion
- protect for future application when designing / constructing / acquiring property for known congestion points (freeway entry ramps, toll plazas, etc.)

APPLICATIONS

- metered freeway entry ramps
- ferry docks
- toll plazas
- paid parking lot entry / exit
- international border crossings
- bridge / tunnel approaches
- past construction-related congestion
- approach to signalized intersection

BENEFITS AND COSTS

Market Reach: ✓

Time Saved: ✓ - ✓✓

Cost Saved: ✓

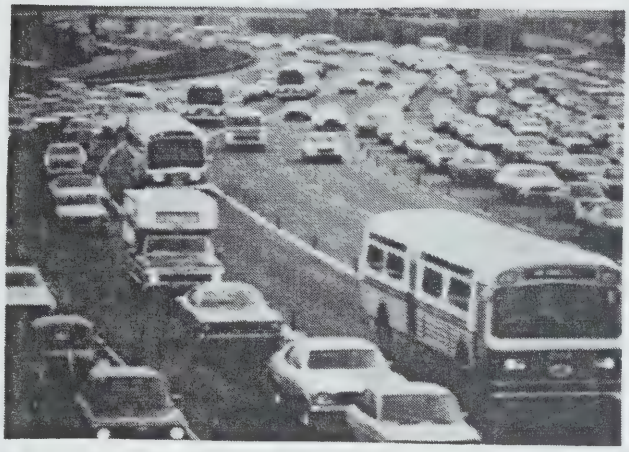
Convenience: ✓✓✓

Capital Cost: ✓✓

Ongoing Cost: ✓✓✓

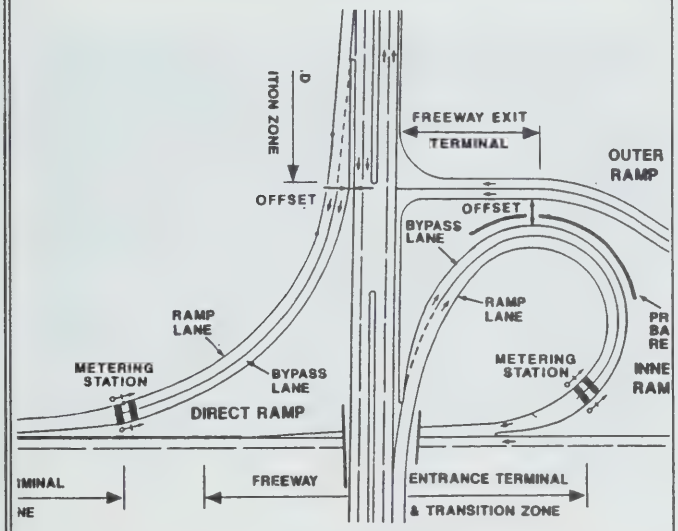
DESIGN GUIDELINES

- for freeway entry ramps, refer to MTO Geometric Design Standards
- for non-Parclo 'A' ramps, develop site-specific design based on 'A' guidelines
- provide ramp metering provisions (detectors, signal heads, etc.) for both metered and bypass lane; operate bypass lane as "permanent" green or at preferential metered rate
- designate one lane for HOVs at any multiple-lane standing queue, and give HOVs preferential rate of release from queue
- signage, regulation, and enforcement are key considerations
- combine with other measures (e.g. not only queue bypass leading up to a toll plaza, but free passage / reduced fee for HOVs through the toll both itself) to maximize overall incentive



Toll Plaza, San Francisco-Oakland Bay Bridge, California

No. of Lanes: 1 (buses), 2 (3+ HOVs)
Length: 1.5 km
Operation: 0600-0900, 1500-1800 WB only
Time Savings: 1-15 minutes
Usage: 100 bus, 3500 passengers, 2300 pools, 8200 passengers (peak period)



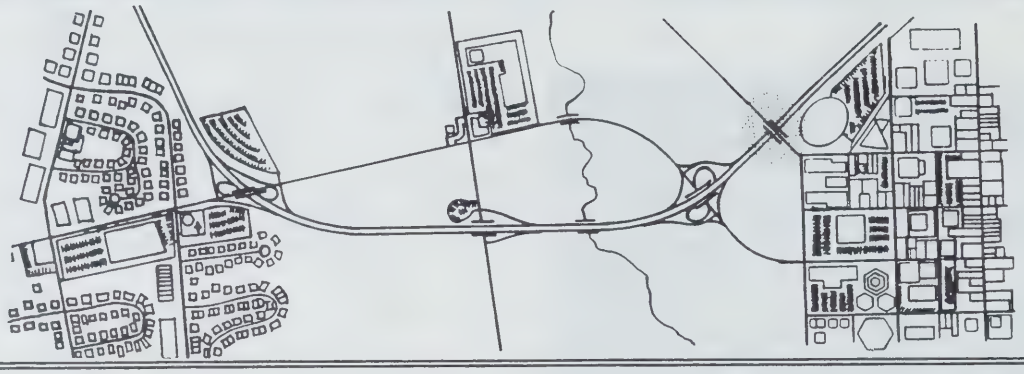
Ramp Meter Bypass Lane Design Standard, Ontario

- from "Geometric Design Standards for Bypass Lanes on Parclo 'A' Interchange Metered Freeway Entrance Ramps", Surveys and Design Office, Ministry of Transportation, Ontario, September 1990.
- all future urban freeway interchanges in MTO Districts 4, 6 and 9 to protect for bypass lanes in property protection (MTO Directive B-247, April 2, 1990)
- no operational experience in Ontario to date
- bypass lane to operate at all times ramp meter is in operation

Washington State Ferry Terminal, Seattle, Washington

- HOVs first on / first off
- HOVs guaranteed place on ferry through "first-on" operation
- HOV 2+ eligibility
- occupancy rate determined by ferry staff when directing incoming vehicles to appropriate queues

HOV INCENTIVE: HOV-Only Direct Ramp 4.8



ACTION

- identify potential locations for direct ramps and determine need / justification
- construct HOV-only ramp at key points in conjunction with median freeway HOV lane
- protect for ability to construct ramp at some future time
- modify crossing road to accommodate intersection

APPLICATIONS

- at high concentration of HOV demand: major park and ride lot, transit terminal, central business district, or major employment area
- where operational impact of at-grade alternatives is undesirable
- where physically and operationally feasible
- where the ramp can provide a significant time savings for HOVs relative to non-ramp alternative
- where benefit / cost analysis provides adequate justification

BENEFITS AND COSTS

Market Reach: ✓ - ✓✓

Time Saved: ✓✓ - ✓✓✓

Cost Saved: ✓

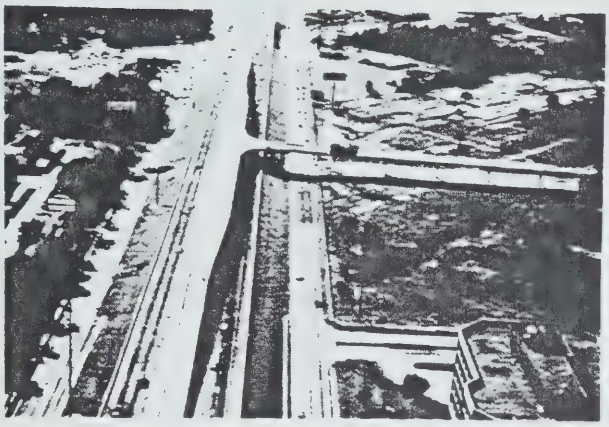
Convenience: ✓✓✓

Capital Cost: ✓

Ongoing Cost: ✓✓

DESIGN GUIDELINES

- site-specific design (reversible / two-way, drop / Tee / off line, one lane / two lane)
- lower design speed on ramp, but use standard ramp cross-section and entry / exit provisions for freeway speed
- do not retrofit to existing interchange unless operationally acceptable; prefer connection to crossing roadway or new HOV-only crossing
- clear signage and pavement markings
- shoulder / extra lane required on ramp to allow HOV bypass of stopped vehicle
- minimum demand justification threshold depends on physical fit, cost-effectiveness of ramp, available alternatives for moving HOVs between HOV lane and major generator, ability to build new / retrofit structure, etc.



US 290, Houston, Texas, - Pinemont Interchange

- direct link between reversible freeway median HOV lane (elevated) and 930 space park and ride lot
- access to inbound HOV lane only in a.m.; exit from reversed operation in p.m.
- acceleration / deceleration lanes provided on HOV lane

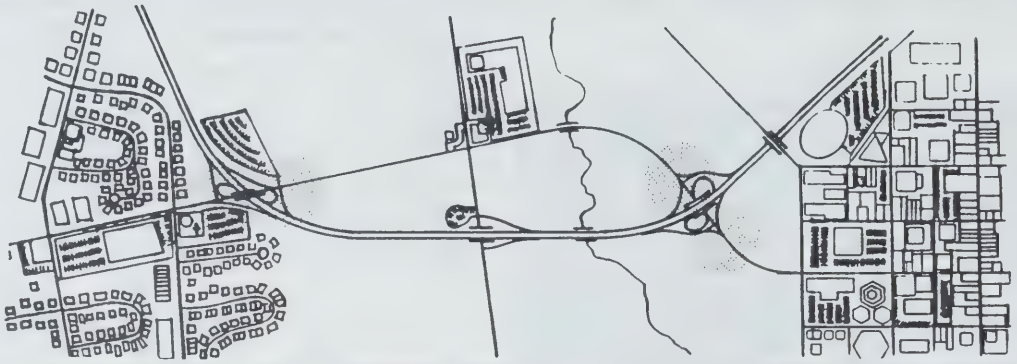
I-95, Miami, Florida

- direct link between freeway median HOV 2+ lanes and major park and ride lot
- permanent two-way operation
- oriented to serve travel to and from downtown only

I-91 Hartford, Connecticut (Now Open)

- direct link between freeway median HOV 2+ lanes and crossing roadway
- permanent two-way operation
- can provide "mirror image" ramp on other side of crossing road to allow transit interface and all-direction HOV access
- no other interchange ramps at crossing road
- low volume HOV ramp does not require signalized intersection on crossing road

HOV INCENTIVE: Freeway Transit Interface 4.9



ACTION

- protect for interface needs at all urban freeway interchanges, as well as select rural freeways
- implement where required by freeway line-haul bus service

APPLICATIONS

- all freeway interchanges where a freeway transit service is provided
- protect for opportunities in future (through interchange design and property protection)

BENEFITS AND COSTS

Market Reach: -

Time Saved: ✓✓

Cost Saved: ✓

Convenience: ✓✓✓

Capital Cost: ✓✓

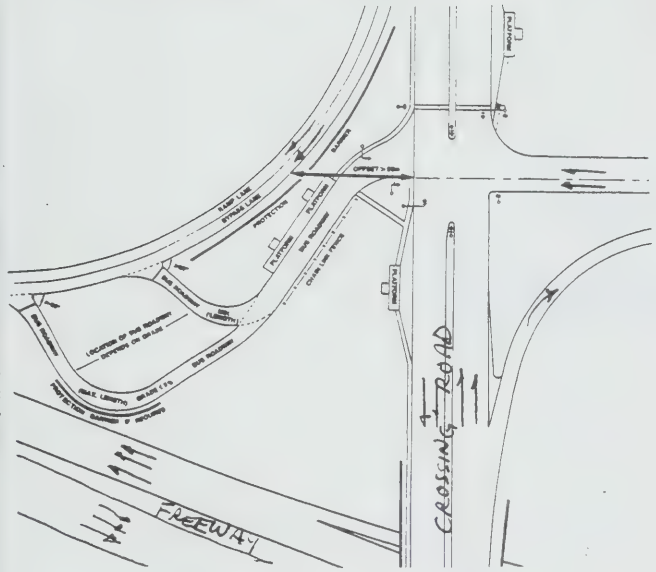
Ongoing Cost: ✓✓✓

DESIGN GUIDELINES

- refer to "Geometric Design Standards for the Interface of Freeway and Local Bus Service at Parclo 'A' Interchanges", Surveys and Design Office, MTO, September 1990, and supplementary report (Type II Interface), July 1991.
- for other interchange configurations, develop site-specific design based on Parclo 'A' principles

Queensway Station, Ottawa Transitway

- grade-separated intersection of major freeway and bus-only Transitway
- 50-60 buses / peak hour on Transitway; freeway express bus service 4/h all day
- shelters and platforms at both levels; stairs and elevators provided
- used for transferring passengers only; no "walk-in" use
- passengers protected from freeway traffic by shoulder and concrete barrier
- freeway buses access platform via bus-only ramp from adjacent interchange; exit to freeway via merge ramp (and vice versa)
- three bus-only ramps provide all necessary bus moves between freeway and Transitway



Ontario Design Standards

- Type II Interface, "Geometric Design Standards for the Interface of Freeway and Local Bus Service at Parclo 'A' Interchanges", Surveys and Design Office, Ministry of Transportation, Ontario, September 1990
- three interface types, covering most typical configurations
- combine bus platforms, bus-only roadway (to allow exit and re-entry to freeway), and HOV or bus-only ramp meter bypass lane
- transit interface to be protected for in all new urban freeway designs in Ontario (MTO Directive 1991)

I-405, Seattle

- bus stop on entry ramp to right side freeway HOV lane
- serves walk-in, transferring, and park and ride passengers
- located on entry ramp of diamond-type interchange

APPENDIX A

ILLUSTRATION CREDITS

ILLUSTRATION CREDITS

Group	Measure	Credit / Source for Example Illustration
1. CONVENIENCE / ENCOURAGEMENT	1.1 Employer Incentives	a) None b) Leasing brochure, CB Commercial, Anaheim, California
	1.2 Ridematch Program	a) Brochure (excerpt), Transp. Energy & Productivity Office, MTO b) "Development of a Strategy for a Ridesharing Centre", IBI Group for MTO, March 1991 c) Newspaper (excerpt), The Rideshare Company, Hartford, Conn., Oct. 1992
	1.3 Vanpool Program	a) "Employer-Sponsored Vanpooling in Ontario - 1989 Inventory", MTO b) Transportation Energy Newsletter, Dec. 1985, MTEEAC, MTO c) "Transit Funding Facts", Metro Seattle, Jan. 1985
	1.4 Guaranteed Ride Home	a) S. Schijns, McCormick Rankin b) "Guaranteed Ride Home: Taking the Worry out of Ridesharing", Commuter Transp. Services Inc., Nov. 1990
	1.5 Marketing	a) Newsletter, Washington State Dept. of Transp., 1991 b) Brochure, Minnesota Dept. of Transportation, 1992 c) "Banfield HOV Lanes" Final Report, Oregon State Hwy. Div., March 1978
	1.6 Information	a) S. Schijns, McCormick Rankin, 1993 b) S. Schijns, McCormick Rankin, 1993 c) MTEEAC News, Winter 1991, Transp. Energy and Productivity Office, MTO
	1.7 Trip Reduction Plans	a) North America Road Atlas, Gousha Chek-Chart, 1984 b) "HOV Facilities - A Planning, Design and Operation Manual", C. Fuhs, 1990, p. 4-2-3. c) City of Pleasanton
	1.8 Transportation Management Associations	a) The Globe and Mail, Sept. 18, 1991 b) "TMAs: Organization, Implementation, and Evaluation", E. Ferguson, C Ross, and M. Meyer, Transportation Research Record 1346, Transportation Research Board, 1992
2. PARKING	2.1 Park and Ride Lot	a) "OC Transpo - Serving Canada's Capital" brochure, Ottawa-Carleton, Regional Transit Commission b) "Status Report on HOV Facilities and Activities in the Puget Sound Region", HOV Task Force, March 1991 c) "The High Occupancy Vehicle System - Houston, Texas", Texas Transportation Institute, 1991, p. 10
	2.2 Carpool Parking Lot	a) S. Schijns, McCormick Rankin, 1993 b) S. Schijns, McCormick Rankin, 1991 c) "HOV Facilities...", C. Fuhs, 1990 p. 2-4-7

ILLUSTRATION CREDITS

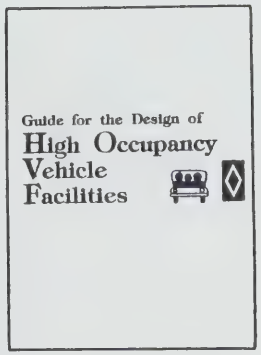
Group	Measure	Credit / Source for Example Illustration
2. PARKING (Cont'd)	2.3 Preferential Parking Spaces	a) S. Schijns, McCormick Rankin, 1992 b) Fuelsaver, Spring 1991, Ministry of Transportation of Ontario c) S. Schijns, McCormick Rankin, 1991
	2.4 Preferential Parking Rates	a) "HOV Facilities...", C. Fuhs, 1990 b) "Effect of Ending Employer-Paid Parking for Solo Drivers", M. Surber, D. Shoup, M. Wachs, Transportation Research Record, 957, 1984
	2.5 Parking Bonuses	a) McCormick Rankin b) N/A
3. OPERATIONS AND SERVICES	3.1 Express Bus Service	a) "OC Transpo - Serving Canada's Capital", OC Transpo b) "Twenty-five Years on the GO", GO Transit, Toronto, 1992, p. 21 c) 1991-92 Schedule, Mississauga Transit
	3.2 Signal Operations	a) "HOV Facilities...", C. Fuhs, 1990, p. 4-2-22 b) S. Schijns, McCormick Rankin, Oct. 1992 c) Regional Municipality of Ottawa-Carleton
	3.3 Enforcement	a) "HOV Facilities...", C. Fuhs, 1990, p. 3-6-11 b) Brochure, Seattle HOV Task Force, 1989 c) Metro Toronto HOV Network Study, March 1992
4. ON-LINE PHYSICAL FACILITIES	4.1 Freeway HOV Lane	a) "HOV Facilities...", C. Fuhs, 1990, p. 4-2-3 b) ibid, p. 4-3-5 c) ibid, p. 4-2-16 d) "Status Report on HOV Facilities and Activities in the Puget Sound Region", HOV Task Force, March 1991
	4.2 Freeway Bus Lane	a) S. Schijns, McCormick Rankin, 1992 b) S. Schijns, McCormick Rankin, 1991 c) "HOV Facilities...", C. Fuhs, 1990, p. 1-3-2
	4.3 Arterial HOV Lane	a) S. Schijns, McCormick Rankin, 1992 b) S. Schijns, McCormick Rankin, 1992 c) "Commuter Lanes", Santa Clara County Transit, 1985
	4.4 Arterial Bus Lane	a) S. Schijns, McCormick Rankin, 1993 b) P. de Groote, Toronto Transit Commission, 1990 c) Transit Topics, Canadian Urban Transit Assoc., Nov. 1990, p. 31
	4.5 Bus-Only Roadway (Transitway)	a) S. Schijns, McCormick Rankin b) "International HOV Facilities", K. Turnbull, Transportation Research Record 1360, Transportation Research Board, 1992 c) S. Schijns, McCormick Rankin

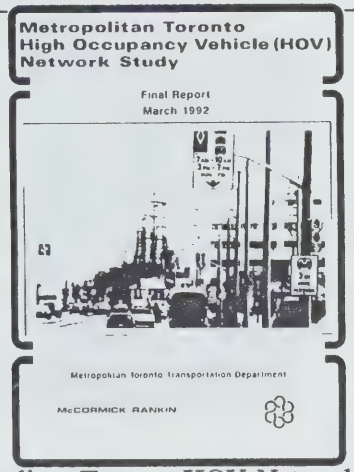
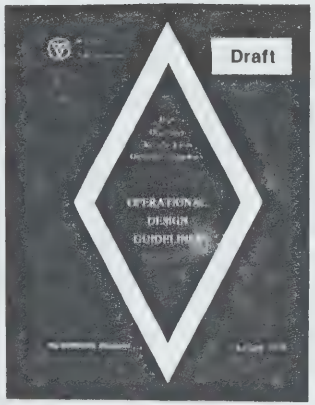
ILLUSTRATION CREDITS

Group	Measure	Credit / Source for Example Illustration
4. ON-LINE PHYSICAL FACILITIES (Cont'd)	4.6 Bus-Only Street (Transit Mall)	a) S. Schijns, McCormick Rankin, Oct. 1992 b) R. Mehta, McCormick Rankin, 1993 c) Engineering Department, City of Vancouver
	4.7 Queue Bypass Lane	a) Fig 2-11, "Revised Manual for Planning, Designing and Operating Transitway Facilities in Texas", State Dept. of Hwys. and Public Transp., April 1989 b) C. Fuhs, Parsons Brinckerhoff Quade & Douglas c) ibid
	4.8 HOV-Only Direct Ramp	a) C. Fuhs, Parsons Brinckerhoff Quade & Douglas b) C. Fuhs, Parsons Brinckerhoff Quade & Douglas c) C. Fuhs, Parsons Brinckerhoff Quade & Douglas
	4.9 Freeway Transit Interface	a) S. Schijns, McCormick Rankin, 1992 b) Surveys and Design Office, MTO, Sept. 1990

APPENDIX B

SOURCES OF ADDITIONAL INFORMATION

WHERE TO OBTAIN MORE HOV INFORMATION		
Document	**Contents**	**Contact**
• Transportation Energy Analysis Manual (1983) • Municipal Transportation Energy and Efficiency Advisory Committee (MTEEAC) Newsletter (1982-present) • Carpool / Vanpool Implementation Handbooks for Employers (1990) • HOV Opportunities, Incentives and Examples: A Handbook for Ontario Municipalities (1983) • Others	Extensive and varied library of energy-conservation-oriented publications of direct relevance to Ontario municipalities. All aspects of ridesharing, HOV treatments, fleet management, energy analysis, and ridematching are covered. The Branch is actively involved in promoting ridematch services, municipal studies, and employer initiatives to increase transportation energy efficiency.	Head, Administration and Technical Publications Section Transportation Technology and Energy Branch Ministry of Transportation of Ontario Room 333, 3rd Floor 1201 Wilson Avenue Downsview, Ontario M3M 1J8 Atten: Irene Rapa Ph: (416) 235-5042 Fax: (416) 235-4936
 Guide for the Design of High Occupancy Vehicle Facilities (1992)	Planning, Operation and Design considerations with respect to HOV facilities on freeway and arterial streets. Updated version of 1983 publication "Guide for the Design of HOV and Public Transfer Facilities". Separate simultaneous publication deals with parking: "Guide for the Design of Park-and-Ride Facilities".	American Association of State Highway and Transportation Officials (AASHTO) 444 North Capital Street, N.W. Suite 225 Washington, D.C. U.S.A. 20001

WHERE TO OBTAIN MORE HOV INFORMATION		
Document	**Contents**	**Contact**
 Metropolitan Toronto HOV Network Study (March 1992)	Comprehensive study to develop HOV 3+ lane network on urban arterial system. Final documentation includes: • Summary Report • Tech. Rpt. #1 - Planning and Design Guidelines • Tech. Rpt. #2 - HOV Experience and Opportunities • Tech. Rpt. #3 - HOV Plan Development for Metro • Tech. Rpt. #4 - HOV Issues and Priority Programs • Bibliography	Transportation Department Municipality of Metropolitan Toronto 17th Floor, 55 John Street Toronto, Ontario M5V 3C6 Atten: Tom Mulligan Assistant Director - Planning Ph: (416) 392-8329 Fax: (416) 392-4426
 Operational Design Guidelines for High Occupancy Vehicle Lanes on Ontario Freeways (to be printed 1993)	Basic document for freeway-oriented HOV planning in Ontario. Contains Operational Planning Considerations, Design Guidelines for HOV Facilities, an overview of HOV Priority Programs, and an annotated HOV Bibliography	Surveys and Design Office Ministry of Transportation of Ontario 2nd Floor, West Building 1201 Wilson Avenue Downsview, Ontario M3M 1J8 Atten: Tom Klement, Manager Ph: (416) 235-3493 Fax: (416) 235-5314

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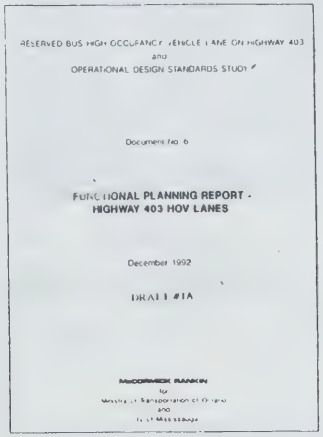
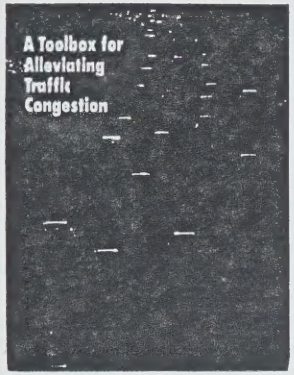
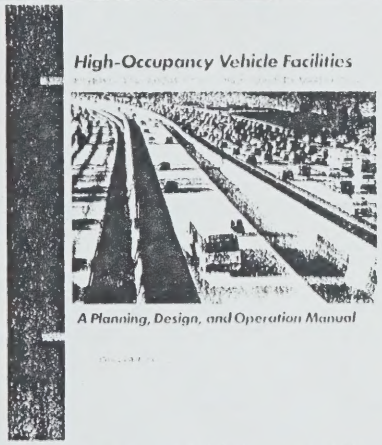
Document	**Contents**	**Contact**
 Highway 403 HOVL / RBL Functional Planning Report (1993)	Development of integrated freeway / HOV lane / Reserved Bus Lane / Transitway system in complex urban corridor. Includes existing conditions, travel demand, need and justification, alternatives, planning and design criteria, implementation strategies, and recommended plan. First Canadian report of its type.	Planning and Design Section Central Region Ministry of Transportation of Ontario 4th Floor, Atrium Tower Downsview, Ontario M3M 1J8 Atten: Len Dutchak, Area Manager Ph: (416) 235-5528 Fax: (416) 235-4382
Proceedings of National HOV Conferences 1. Los Angeles, 1986 2. Houston, 1987 3. Minneapolis, 1988 4. Washington, 1990 5. Seattle, 1991 6. Ottawa, 1992 (7. South California, 1994)	Papers presented at key gatherings of HOV practitioners every 18 months±. All aspects of HOV practice covered, including practical experience, design issues, planning process, marketing, incentive program, institutional / funding arrangements, and innovative strategies.	HOV Systems Committee Transportation Research Board National Research Council 2001 Wisconsin Avenue, N.W. Washington, D.C. U.S.A. Ph: (202) 334-2934 Fax: (202) 334-2003

WHERE TO OBTAIN MORE HOV INFORMATION		
Document	**Contents**	**Contact**
 A Toolbox for Alleviating Traffic Congestion (1989)	Oriented towards elected officials, non-technical decision-makers, and the media. Includes Overview of Congestion Causes, Development of a Coordinated Program, and item-by-item descriptions of various strategies to optimize highway efficiency, build new capacity, provide transit, manage demand, and institute funding and organizational strategies. Each item includes implementation techniques, benefits, costs, and references / examples.	Institute of Transportation Engineers 525 School Street, S.W., Suite 410 Washington, D. C. 20024-2797 U.S.A. Ph: (202) 554-8050 Fax: (202) 863-5486 ($35 / $25 ITE Members)
 High Occupancy Vehicles - A Planning, Design and Operation Manual (1990)	"State of the Art" compilation of HOV planning, operation and design theory and practice, including information on all freeway HOV projects in the U.S. No coverage of arterial issues, but freeway-oriented parking transit measures are included. Numerous photos and plans of operating projects.	Charles A. Fuhs, Parsons Brinckerhoff Quade and Douglas, Inc. 505 South Main Street, Suite 900 Orange, California 92668 U.S.A. Ph: (714) 973-4880 Fax: (714) 973-4918 ($50 U.S. / copy)